MINING MOURMALL

Volume 14

MARCH, 1928

No. 3

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Reports on the Mechanization Survey

Contributors:

H. Foster Bain, A. Cressy Morrison, D. D. Potter, Charles D. Hamel, Frank E. Wright, John L. Boardman, George S. Rice, P. L. Cowan, Philip D. Smith, D. Harrington, C. C. Cushwa, S. B. King, J. J. Rutledge, William A. Forbes, Arthur C. Green, G. B. Southward.



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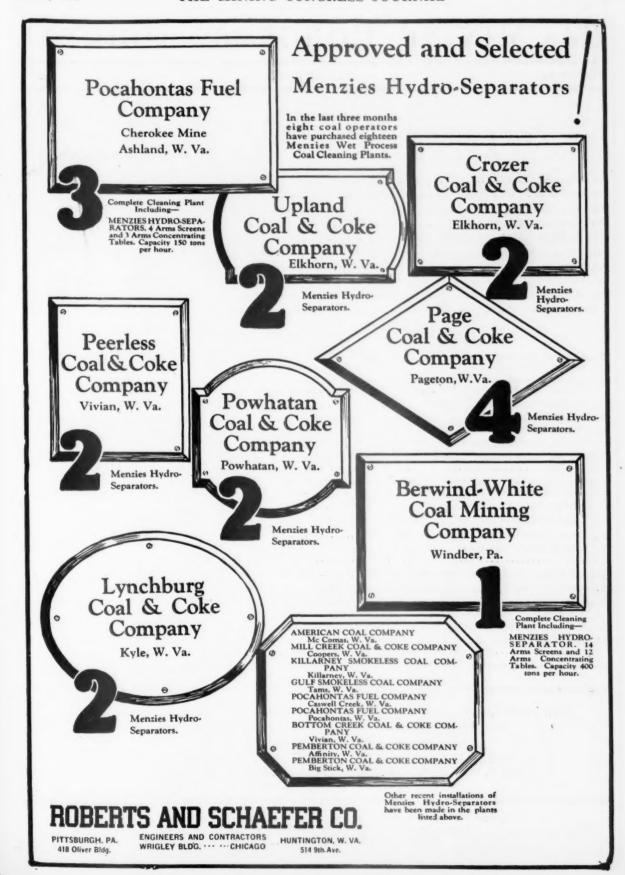
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The MINING CONGRESS JOURNAL

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PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

Pumping at the Park Utah Mine
The Romance of the Diamond Drill

COAL

Should Black Powder in Bituminous Coal Mines Be Prohibited

Coal, Coke and By-Production

Selecting Motive Power and Type of Locomotive

Published Every Month by The American Mining Congress, Washington, D. C.

Edited under the supervision of James F. Callbreath, Secretary of The American Mining Congress

E. R. COOMBES, Editor

GUY N. BJORGE, Associate Editor ERNEST H. PULLMAN, Legislative Editor NEWELL G. ALFORD, Associate Editor F. E. PRIOR, Art Editor

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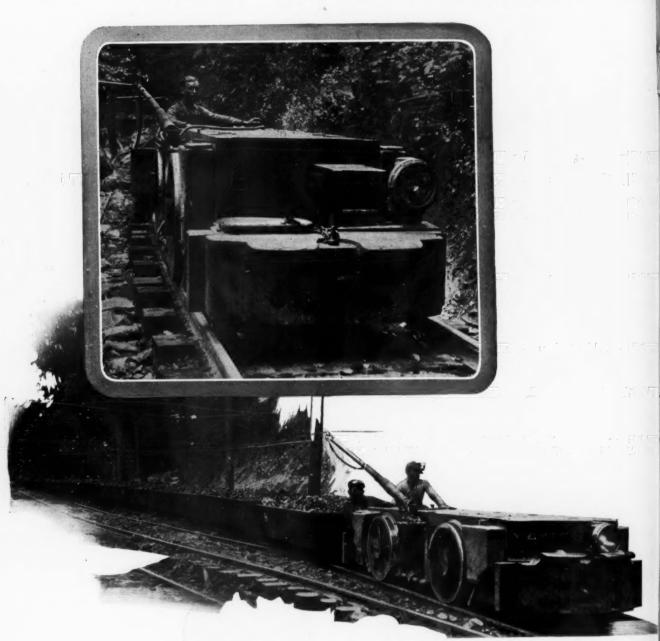
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These two Jeffrey Armorplate Locomotives haul all the coal at the Red Jacket Coal Company's No. 5 Mine. The tipple is more than a mile around the mountain and the track is laid over many curves and grades.

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These Jeffrey Haulage Locomotives are built for the convenience of the men that operate them as well as for long service. The motorman's cab is roomy and comfortable. All controls for power, braking, headlights, sand boxes, and gong are within a short distance of the seat.

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COAL MINE EQUIPMENT



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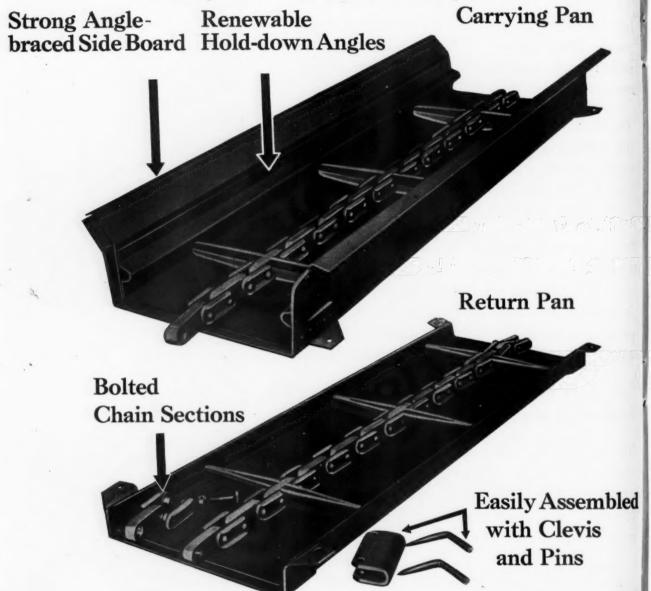
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Mine Conveyor Sections E

Jeffrey 47-A Sectional Conveyor



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To add a section: the end section is disconnected and dragged forward six feet, then the bottom pan is laid in place and its section of chain is bolted into the lower strand. The carrier pan is laid over the bottom pan and the new top chain section bolted in place; the pins are driven through the clevises and the conveyor is ready to resume work.

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Since the conveyor works with a positive pull, the head end can be elevated to load into mine cars of any height.

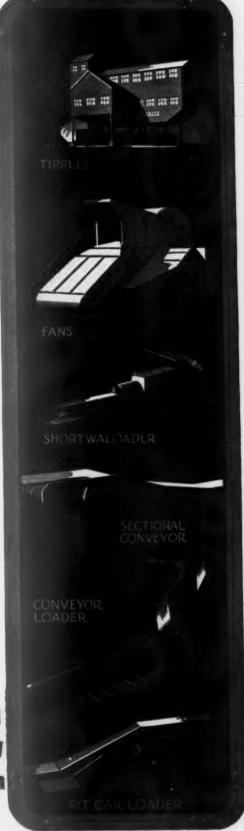
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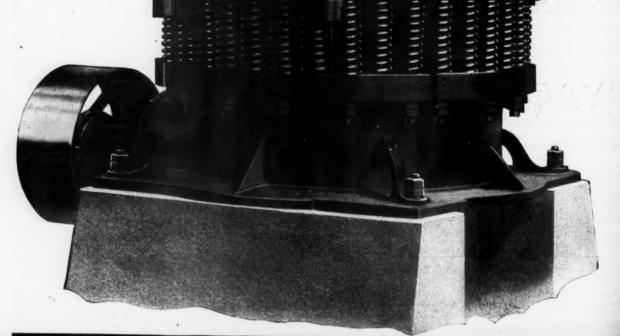
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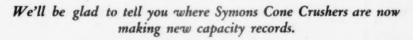


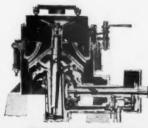
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Black Blasting Powder ignites very readily. Hercoal-F is difficult to ignite, a very important safety

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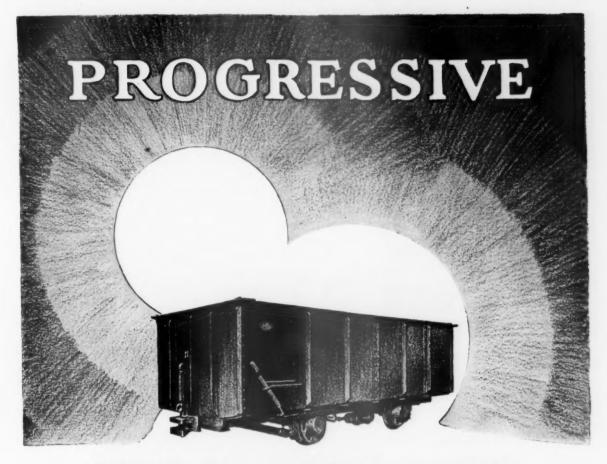
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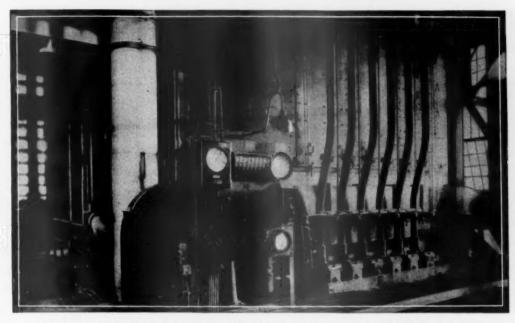


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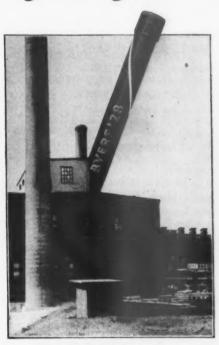
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CARNEGIE STEEL MINE TIES



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4063-Drifter drills

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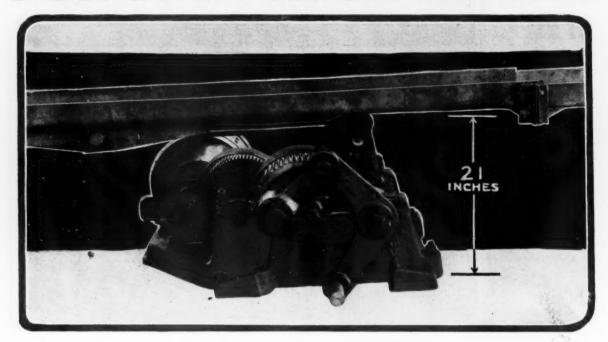
Many of the largest mines, quarries, and contracts have standardized on Ingersoll-Rand Drills. These tools, through their widespread use all over the world, have played an important part in the progress of the last half-century.

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As an earnest of the newly discovered properties of carbon, he produced the first electric arc light, using two pieces of charcoal. It was the most brilliant light mortal man had ever struck, and it came from the blackest of all substances.

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S U L TRADE L MARK I V A N

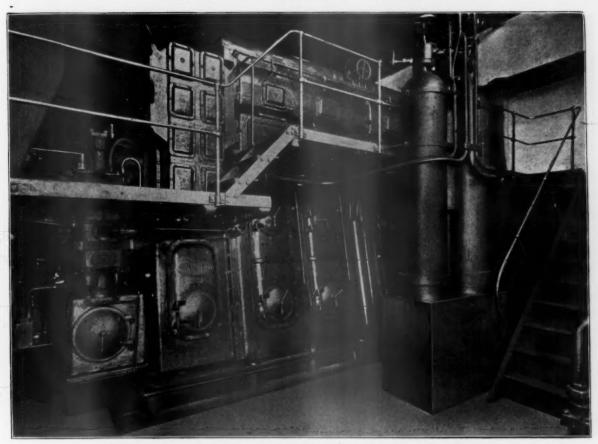
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Busch-Sulzer Diesel Engine, Prairie Pipe Line Company, Independence, Kansas

Prairie Pipe Line Company Demands Perfect Lubrication

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Because of the heavy load which this engine carries for long periods of uninterrupted operation, perfect lubrication is essential to satisfactory performance. Argon Diesel Oil is used on the power cylinders and compressors and Argon Heavy Engine Oil is used in the crankcase.

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THE BOSS:

EXPERTS BE HANGED! Our own experience dictates otherwise. Men from the mines visit our factory every week and, almost without exception, each man expresses himself astonished at the size and extent of our buildings, the character of the machinery and the modern methods in use. These men are representative of the mines. Why shouldn't we show the factory to ALL of our friends in the coal fields?

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Wolmanized mine timbers lessen the fire hazard in the mine.



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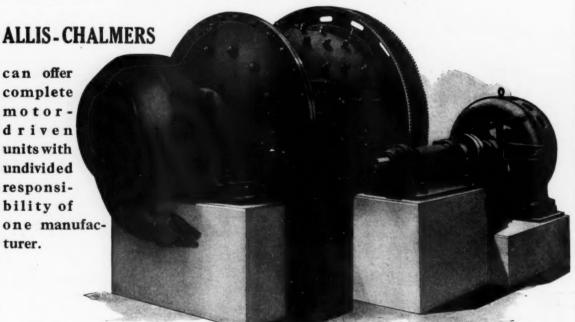
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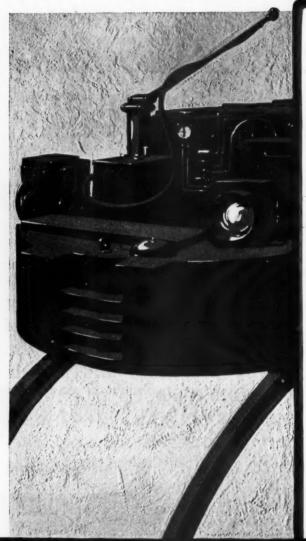
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The

MINING CONGRESS JOURNAL

A Monthly Magazine—The Spokesman For The Mining Industry— Published By The American Mining Congress

VOLUME 14

MARCH, 1928

NUMBER 3

Editorials

The recent review of the silver market by Handy and Harman expresses the hope that the average price level

of silver during 1928 will be higher than the 1927 price. From the statistics presented there seems to be ground for a still more hopeful situation than expressed in this report. The total world production

during 1927 was 251 million

THE FUTURE OF SILVER

ounces. Other world sources of silver which were absorbed amount to 14 million ounces, these being made up by the debasement of British coin, the demonetization of the French coinage, and silver sales by the Indian Government. The 14 million ounces thus made available were absorbed together with the world production without seriously affecting the world market

The average price of silver for the year was 56.37 cents, while the highest quotation was 60 cents and the lowest 53.52 cents.

It is noted that the widest variation of the monthly average price was just a little above 3 cents per ounce, while the December average was 2 cents above the January price. The production of the United States was 54.9 million ounces, while the exports total 127.5 million ounces and the amount used in arts and manufactures was 33.5 million ounces, showing that while our production was 59 million ounces, that 161 million ounces were either used for manufacturing or exported. Much encouragement may be drawn from this statement for the future of silver. This hope is supported by the further fact that our production of silver for the years 1924-25-26-27 are shown as follows:

			Ounces	0.00	
	1924	1925	1926	1927	
United States Production	65.4	64	62	59	
United States Exports	155	135	139	127	

During those years silver amounting to about 200 million ounces was imported and about 50 million ounces of secondary silver was reclaimed.

These figures show that the total of silver to be accounted for during those years was 500 million ounces; that we exported 556 million ounces. It is well known that production of silver from siliceous ores is not profitable at the present average price and that nothing below a 70-cent price will justify any increase in silver production from these sources. This direct production fell considerably in 1927, while the production as a byproduct of copper, lead and zinc, was so high as to

nearly equal silver production records for the country

as a whole during previous years.

Altogether the report of Handy and Harman brings an encouraging note to the silver industry and indicates that in the not too far distant future the business of silver mining will again become prosperous.

Serious curtailment of American business and loss of prestige in the Latin-American countries will result

IMMIGRATION

AND

PUBLIC WELFARE

from the application of quota restrictions to immigration from countries of the Western Hemisphere similar to those applied to European countries. This is the unanimous conclusion of all who appeared before the House Im-

migration Committee on behalf of American agricultural, commercial, and industrial interests, in opposition to the Box bill.

Proponents of the bill allege that grave social and racial problems are becoming increasingly apparent by reason of the influx of laborers from Mexico. They contend that many of these people are diseased and are a burden upon the communities in which they live. They assert that these people maintain the lowest standards of living, and that insanitary conditions and immorality threaten the communities in which they live with plague and pestilence.

If any of these allegations are true, we already have on the statute books laws that are ample to deal with the situation. Mexicans do not become American citizens. Most of them remain only for the cropping seasons, and are merely temporary residents. However, those who remain for longer periods can be deported for cause. And any who are diseased, insanitary, immoral, or dependent upon charity, can be kept out under present All that needs to be done is to strengthen the Public Health Service and the border patrol by providing adequate personnel. In any event, unless this is done, these classes would filter across the border notwithstanding quota restrictions.

The health and prosperity of the people of the United States is a first consideration, of course, but we believe the promotion and maintenance of friendly relations between the United States and other countries of the Western Hemisphere is of far greater importance to the welfare and prosperity of the United States than Mexican immigration. The United States markets in the Latin-American countries are growing. Recent developments, such as the Pan American conference and Colonel Lindbergh's Central and South American flights have stimulated friendly relations to a high degree, opening the way for a greater export trade. This means employment and good wages for all classes of labor em-

ployed in production to supply this trade.

So it is very necessary that Congress shall take no action that would disturb this situation or undo what has been accomplished in this direction. Freedom of residence and travel throughout the Western Hemisphere for citizens of the United States is essential to the welfare and continued prosperity of this country. The Mexican immigration question is relatively insignificant as compared with this. Congress should consider the question on the broad, fundamental principles involved, and should not be guided or influenced by conditions or political factors that are more or less local in character and more or less trivial in comparison with the international aspects of the problem.

Practically without objection the Johnson resolution (S. Res. 105) was approved by the Senate. This reso-

SENATORIAL COAL INVESTIGATION lution provides for a "thorough and complete investigation of the conditions existing in the coal fields of central Pennsylvania, western Pennsylvania, West Virginia, and Ohio; also to ascertain whether the railroad com-

panies and their officials have been or are, by agreement or otherwise, endeavoring to depress the labor cost of coal produced by union mine labor; also whether in the said coal fields wage contracts have been abrogated or repudiated, whether defenseless men, women and children, without cause, have been evicted from their homes, and generally what has transpired in the said coal fields, and the reasons for conditions and happenings therein; and in this connection the said committee or a subcommittee thereof shall ascertain whether in industrial disputes or strikes in said coal fields injunctions have been issued in violation of constitutional rights and whether by injunction or otherwise, the rights granted by the Constitution of the United States have been abrogated and denied."

This investigation is being made under the direction of the Interstate Commerce Committee, of which Senator Watson of Indiana is chairman, by a subcommittee consisting of Senators Gooding, Wheeler, Wagner and Pine. In the hearings before the committee which recommended the bill to the Senate, stress was laid upon the very deplorable condition of the striking miners of the Pittsburgh field and the alleged improper use of court injunctions.

No one will question the deplorable conditions of families, the heads of which are without income, and our sympathy goes out to the women and children who are housed in barracks, although we may question the right of a family head to refuse work and to make his wife and children stand the brunt of a fight for a principle.

What is the principle for which these strikers are contending? Fundamentally it is that a man having been employed at a certain piece of work has a vested right to the job. The Union insists that the contract for service must be one-sided, that the labor man may give up his job whenever he so elects, but that the employer can not exercise the corresponding privilege of terminating the wage contract at will. The Union goes

further and insists that when the employe does refuse to work that no one else shall be employed to perform that service. The Union goes even further than this in that it insists that the courts have no right to protect the property of the employer or his life by forbidding interference with those rights of property and liberty which are the fundamental bases of our governmental structure.

The Mining Congress Journal insists that the ultimate welfare of the wage earner depends upon absolute liberty of contract. It further believes that the prosperity of our country depends upon the right of every individual to sell that which he has to sell in the best possible market, whether it be his services or the product of his services, and that he shall be permitted to retain those things which he can not sell on terms satisfactory to himself. It is also fundamental that no government can exist except with the strong hand of the law which protects the citizen in his rights of liberty or property as against those who seek to interfere with those rights.

The injunction is a court order to prevent the doing of an act which the law already prohibits, in such cases and only such cases where redress is impossible through court action for damage. The ordinary mine injunction requires that there shall be no interference with the personal or property rights of the mine owner, and is issued to restrain individuals who are unable to respond in case judgment should be obtained in an action at law

for the damage suffered by the employer.

Organized labor has refused to make itself responsible by incorporation. Until organized labor is willing to accept responsibility for the damage created by its own act, it ought not to find fault with any effort by the courts to protect the rights of those whose property is endangered. It is the duty of government to proteet the rights of individuals. It is the duty of courts to punish those who violate the rights of others. It may be true that there have been abuses in the issuance of injunctions, but the instances of this kind are rare indeed as compared with the instances where strikers have undertaken to intimidate other citizens who desired to work, where they have assaulted and frequently murdered those who undertook to work, where buildings have been burned and mine plants dynamited, in order to force the operator to recognize and yield to a demand on the part of men with whom he has no contract relation. There can be no legal right to require a man to work for unsatisfactory wages and in unsatisfactory conditions, nor can there be a legal right to require a citizen to employ others under any conditions,

The very essence of a contract, i. e., the meeting of minds in mutual agreement, requires that both sides shall assent to the terms and conditions. If this be true the striking miners have no right to their jobs, and have no right to interfere with those who are now filling those jobs.

The trouble in the Pittsburgh district grew out of an effort on the part of unemployed men to take jobs away from other men who are employed under contracts which are satisfactory to them and to their employers. These men, many of them, also have families to support, and the effort of the Union is to take the bread from the mouths of other wives and children which they will not accept for their own wives and children. These men who have refused to accept employment apparently are deliberately seeking to exaggerate their suffering in making an appeal for public sympathy as a means to securing privileges to which they are not entitled.

The investigating committee can perform a very great

public service by bringing out all of the facts in connection with this deplorable situation. In the hearings especial animosity has been manifested toward the Pittsburgh Coal Company. This great corporation has an enormous investment upon which its stockholders expect it to earn a profit. It has complete equipment, vast resources, and a particularly favorable location, and yet it has either been idle or operating at a loss for a long time before and since the signing of the Jacksonville wage-scale agreement. For many years before, and some time after, the principle operations of the Pittsburgh Coal Company were carried on by union labor. For years western Pennsylvania, with the States of Ohio, Indiana and Illinois, was spoken of as a Union Field in which operations were conducted through the employment of members of the United Mine Workers. An entire readjustment of the bituminous coal business was in process. To meet the newer competition, severe reductions in production costs were necessary. introduction of labor-saving devices by which cost might be reduced was opposed by the Union, and permission was given for the use of machinery only upon terms which gave to the worker a substantial share in the benefits to be derived from the use of such machinery, so that the effect upon production costs was not sufficient to overcome the general economic handicap in the Pittsburgh field.

About 70 percent of the cost of coal at the pit mouth is represented in the wages paid. Every effort to adjust this wage scale to meet competition which could not be avoided was met by the slogan "No Backward Step"—no backward step from a wage scale 27½ percent above the level of war peak wages. It can not be assumed that the employers in the Pittsburgh district were so antagonistic to the Union as to be willing to sacrifice their profits, that the managers were willing to sacrifice its most important business in order to get even with the miners.

The facts are, that these men, like business men everywhere, were trying at all times to so handle their business affairs as to meet their expenses and leave a fair margin of profit for their stockholders. The Mining Congress Journal holds no brief for the Pittsburgh operators, but it does believe that a fair investigation of the conditions in that district will demonstrate that those operators instead of being the enemies of the Union labor would gladly now employ union labor if given any assurance on its part of a willingness to cooperate with the operators in saving the coal industry of that district from bankruptcy.

If the United States Senate would pause in its mad pursuit of wrong-doer long enough to learn those things that

THE CINCINNATI PROGRAM are right with industry, instead of those things that are wrong, perhaps its investigations would lead to something more than a gesture. At the moment Senators are intent on finding out why people are suffering in the coal-

producing districts. And any one with any vestige of humanity will not fail to recognize the deplorable condition they will discover. Whose fault such suffering is, is not the province of this editorial. Rather, we would call the attention of Congress, and of the interested public, to what the industry is doing to bring about a

much different situation in so far as efficient production can contribute.

To say that the operator has no heart; that the miners are the victoms of soulless corporations, and that the industry as a whole is apathetic concerning its workers, are statements without foundation.

For five consecutive years the coal-producing industry has traveled thousands of miles to attend an annual meeting, there to discuss, first and always, how production may be made safe; how production may be made efficient; how costs may be reduced so as to enable the industry to continue to give this country power at an even more ridiculously low figure, and at the same time to pay a commensurate wage to its workers.

At the time of the writing of this editorial, 60 operating men, representing as many different localities and conditions, are engaged in arranging a program for this annual trek to Cincinnati. They are vitally concerned that the program may be a real contribution to the advancement of the industry. They are arranging for the discussion of problems from blasting at the face, to cleaning at the tipple. So seriously did the Committee take their task that they imposed upon themselves nine major sessions, each session to discuss some phase of operation, such as Management and Safety; Transportation; Ventilation; Mechanical Loading; Power and Power Transmission, and Coal Cleaning.

Coal operators will travel from the Pacific Coast and far west regions, from the coal fields of every producing district in the country to contribute to and learn about efficient, safe production methods. There is no reticence on the part of the industry to communicate its findings. The door is opened wide, and all who will may come and participate.

The convention brings many things to the operating personnel of the coal industry, including one of the finest exhibits of mining machinery that it is possible to procure. Every manufacturer of such equipment comes to Cincinnati ready and willing to accommodate himself to the needs of the industry, and to develop the equipment the industry needs, from the smallest safety device to the most modern coal loader and coal cleaning plant.

The coal mining industry is doing more to solve its problems than years of investigation by the politicians could record.

The conventions at Cincinnati are an investment and are paying heavy dividends to those participating. In 1927 more than three thousand operators participated in the discussions. Nineteen hundred and twenty-eight promises to set a new record.

It has recently become so popular to tell what is wrong with the coal industry that men and women of many

WHAT IS RIGHT WITH THE COAL INDUSTRY? professions — Senators, lawyers and fiction writers—feel the irresistible urge to take part in this discussion and add their opinions to the already overburdened supply of literature on this subject.

It is an open question whether many of these writers can actually distinguish anthracite from charcoal and we can not help but believe that all they really know about coal mining is that coal is dug from under the ground—by someone else. However, they continue to write and if asked to tell

something good about the industry they would probably reply that "there ain't no such animal."

Now it may be well to remember that the man who originally made this classic remark was mistaken and there actually was such an animal. It is also worth remembering and keeping the thought uppermost in our minds that all is not wrong with the coal industry. We who are engaged in coal mining know many things about it that are right. We know that loading machines underground are replacing hard physical labor; we know that rock dusting, safety training and other measures are being increasingly employed to lessen the dangers and hazards to the men inside; we know that improved methods of coal cleaning and preparation are being installed to give a better product to the consumer and we know that mergers and consolidations of competing companies are being formed to stabilize coal production.

These things are right and are coming from within the industry itself and if allowed and encouraged to continue and develop, will tend to promote a healthy condition. There is much constructive thought and effort being given to these and to other problems, and while the general outlook in the bituminous industry may to some extent be "viewed with alarm" there are a number of bright spots to which we with some justification may "point with pride."

Without the courts, republican government can not endure. The stability and authority of its courts marks

the difference between the successful democratic government and those governments which are in more or less continual turmoil.

ARBITRATION which are in me tinual turmoil.

The willingness to submit to arbitration is the fundamental basis of any such gov-

ernment. The courts furnish a system of arbitration which in this country is a constitutional requirement and the only means by which various disputes between its citizens can be determined.

Every citizen has his part in the selection of administrative and judicial officers of the country. Having so elected a government consisting of its three separate divisions, every law-abiding citizen is under obligation to submit to its judicial determination whatever disputes he may have, and wherever he fails to so do and undertakes to settle his own disputes by force, he becomes a law-breaker subject to criminal prosecution, and, if convicted, to the punishment which the legislative body has fixed for violation of law.

It is frequently insisted that justice is not always meted out in the determination of such disputes, but the right of appeal is given from one court to another until at the end there must be a body authorized to make final decision which becomes the law of the land. It is not to be expected that decisions will be satisfactory to the losing litigant. Generally speaking, he is a litigant only because he believed himself to be in the right and it is not expected that he will be entirely satisfied with a denial of that theory. But, with the firm establishment of the principle involved, others who might otherwise become litigants are able to adjust themselves to a line of action which as individuals they may not wholly approve.

Arbitration is a method by which the parties voluntarily submit for determination a dispute which they are not willing to submit to the courts which are bound

by precedents and seeking to do exact justice between the parties. Some questions do not involve so much of exact justice as of adjustment to economic conditions and the law of supply and demand.

The six months effort of the Illinois Wage Commission, as it applies to coal mining in that state, has just come to an unsuccessful conclusion. The results demonstrate that the vital question involved was at no time possible of solution. The upholding of the Jacksonville wage scale was at all times insisted upon by one side of the controversy. The Commission was appointed with the hope that some plan might be evolved looking to a modification of that basic wage scale. In view of the fact that a mutual agreement upon this point was essential, and that one side had determined not to give at this point, the net result has been that the consent to a continuance during the period of investigation was obtained for a consideration which the miners denied from the beginning.

A refusal to submit one's differences to impartial judges, gives fairly good proof that the refusing parties have little faith in the justice of their cause.

What the Senate plans to do with the tax revision bill is still in doubt. The bill may not be passed at this

session. Widespread protest has been made against certain features of the bill, and quite general dissatisfaction has been expressed in a voluminous mass of correspondence received by the Senate

Finance Committee and its members, with the administrative provisions of the bill.

TAX REDUCTION

THIS YEAR

EXPRESSING

PUBLIC

OPINION

A simple way to deal with the question would be for Congress to put through a joint resolution for reduction of the corporation rate, and to hold up the matter of general revision of the tax law until the next session. It has been suggested that this might be done, as Congress will be anxious for an early adjournment, and congressional leaders realize that the pending bill probably will require prolonged consideration.

It would be most unfortunate if tax reduction is defeated merely because Congress may not feel disposed to take the time necessary to the passage of a general revision measure, when a joint resolution, covering only the reduction of the corporation rate, would save that feature and give the country the benefit of this reduction this year. Another month probably will reveal the true situation. In the meantime, the public demand for corporate tax reduction this year should be kept at its highest pressure.

Phrases common to newspapers and, in fact, to editorial writers of all strata, are "it is the consensus of

opinion," "the public believes," "American opinion on this subject," etc., etc.

Just what is the source of this great knowledge? Where do these writers obtain their information? Mostly, of course, through conjecture,

based upon the guess of the average reporter, whose business it is to surmise and to define the policy of his paper as the demand of "public opinion."

Almost daily papers throughout the country reiterate the unsubstantiated fact that "the public is demanding regulation of the coal industry by the government." But is it? Just how many of our considerably more than a million populace, outside of those living in the restricted areas of disturbances in the coal industry, actually are aware that certain coal fields are tied up through labor differences; or what districts operate on a union and what on a non-union basis. We venture to say that the percentage is ridiculously negligible, and infinitesimal as a base for the sweeping statement of "it is the consensus of opinion."

The mineral producing industries are not peculiar in their distress. They have plenty of company along their difficult route, including the farmer, the manufacturer, the building trades, and the retail industries. But the baker, and the merchant, and the live stock dealer, and all other of our citizenry not vitally associated with mineral production, are all so close to their own individual problem that the problems of other industries

register zero.

Trouble is inherent in business. And every industrial unit coming into competition with other industrial units, is so busily intent upon solving its own immediate problem, that there is little time left for a desire to demand that any agency not coming directly within its path "be restrained." Just so long as business is competitive, just so long will industry be beset with trouble.

But you may mark down now as absolutely certain, that all of this public opinion, consensus stuff, all of these catch phrases common to newspaper parlance, are born of the opposition, and when traced to their abiding place are nothing more or less than organized minority

asserting itself.

It is well to remember that there is only one real referendum conducted in this country. And that is when we elect a President of the United States. Individual industry may of course speak as a unit, as frequently the mining industry does. But when mining speaks it speaks only for itself, not for the public; when the farming industry speaks as a whole, it represents the individual and collective farmer, but it does not constitute the public; when the manufacturing industry asserts itself as a unit, it represents naturally a great industry, and a large group of citizens, but it does not represent the public.

As nearly as industry may ever be unanimously articulate is through its recognized spokesmen. When all of these spokesmen have agreed that a certain thing is desirable or undesirable, then, and then only, is the sweeping statement of "the public demands" justified.

There is no public unity on questions of coal, oil, public utilities, merchant marine, immigration, or what have you. A little more intelligent use of such phrases would eliminate much of misunderstanding, if in no other quarter, than in the legislative fields of endeavor.

The fuel consumption in the United States requires an annual production of about 500,000,000 tons of bitu-

> COAL MERGERS

minous coal, an average of 10,000,000 a week or 1,500,-000 tons a day. This is a tremendous volume of business and for this amount of coal there is a market already existing which the coal producing industry does not

have to stimulate or make any effort to hold at its present level. There is this much coal needed and someone has to mine it.

These fundamental facts form the basis on which,

theoretically at least, it is possible to build a large and prosperous industry. This prosperity however will have to be built as it will not grow by itself and it should be apparent by this time that those who are expecting that the present discouraging situation will eventually correct itself are likely to be sitting in on a long, tiresome wait.

In several coal fields there is now being evidenced a tendency to end the period of waiting and by a process of mergers and consolidations organize these fields into some form of unified operation or control. This is a sound and logical movement and is being supported by some of our largest coal companies. Some of these mergers have already gone rather far and have overcome several obstacles that have wrecked similar attempts toward consolidation that were undertaken in the past. This progress is decidedly encouraging and we believe is bringing some feeling of optimism into the coal industry.

Attempts made in the past to have Congress restrict the application of the injunctive remedy by the Fed-

> A THREAT AGAINST FREEDOM

eral Courts for protection of fundamental rights of property, have failed. Each Congress, that has dealt with this question, has recognized this as an issue which goes to the heart of the principles upon which the United States Con-

stitution and our American freedom rests; and that to tamper with the fundamental rights and remedies guaranteed to every citizen by restricting the application of the injunctive remedy would impair and undermine the Constitution.

But this issue is again before Congress, in the form of a proposed amendment to the Judicial Code, which provides that equity courts shall have jurisdiction to protect property when there is no remedy at law; and for the purpose of determining such jurisdiction, the proposed amendment provides that nothing shall be held to be property unless it is tangible and transferable. In other words, the injunctive remedy shall apply only to physical property; but not to the right to use property or the right to work. Or, to state it in the simplest language possible, a property owner could make use of the injunctive remedy to protect his property against injury, invasion, or destruction; but could not use it to protect himself against outside interference with his labor and the use of his property, although this might destroy his business and the value of his property.

The American Federation of Labor is backing this proposal. Manifestly the purpose is to deprive employers of the injunctive remedy in labor disputes. But the proposed measure does not apply to labor disputes alone. It would, if adopted, be applicable to all litigation involving the use of the injunctive remedy. It would appear, therefore, that proponents of the measure are willing to deprive all citizens of the broad and proper injunctive protection to which they are now entitled, in order to relieve labor combinations of injunctive restrictions upon their activities against non-members and employers of non-members.

This measure should go the way of previous measures of a similar nature. Fundamental rights must be preserved, and judicial procedure necessary to the protection of those rights must be maintained. The right to work, the rights of life, liberty, and pursuit of happiness, must be protected.







Herbert Hoover



William Kelly



Edwin Ludlow



H. V. Winchell

The AMERICAN INSTITUTE of

IFTY-SEVEN years ago the minds of the people of the United States were beginning to turn from the sectional problems that for long years before and through the Civil War had absorbed their attention. The last of the Southern States had been readmitted to the Union, and in 1869 the first transcontinental railroad was opened for traffic. It was a time when people began to think of things nationally and to be concerned with the orderly development of our great natural wealth. Through the years before deficient transportation and a bewildering abundance of resources had led to local irregular development, with corresponding emphasis on local interests and prestige. The South with her cotton, New England with her shipping, the great prairie states with their abundance of wheat, corn, and cattle were held together by sentiment and historical tradition rather than by the close bonds of economics. California was all but a different world, and most of the various states were substantially independent in their economic life. So long as men depend mainly upon the products of the soil and made but small demand on the minerals beneath it, this was natural and likely to continue, but with the growth of demand for minerals the importance of particular districts flashed into recognition and the necessity for extensive exchanges of products came into being. It is possible to supply food and clothing from almost any part of the United States, but coal, iron, copper, lead, and other minerals can only be mined where nature has placed them. If the people of other districts were to enjoy the use of these metals in quantity, transportation and trade had to be built up.

The United States had just had, as we did again in the years 1917-1919, a sharp lesson in the national importance of minerals. The war of 1860-1865 was won by cannon made of iron, with swords and bayonets of steel, with bullets of lead, and by armies transported on rails, quite as truly as by foot soldiers and army mules. To supply the forces both North

and South mines had been opened and pushed to the limit of production, metallurgical plants had been built and operated, and manufacturing on a considerable scale had been undertaken. Also, as always in war time, while there had been much individual distress and suffering, new and great fortunes had been created. There was every incentive, as in our own post-war years, to turn the war plants and war fortunes into manufacture for peace time, and a vivid picture had been painted so that all could see it, of the possibility of using our mineral wealth as well as that from our forests and fields to make life easier

Experience had been gained in organization and a new and large demand had been created for engineers, men who could handle the forces of nature for the benefit of mankind. Not all of this was fully visualized, but the underlying forces and motives were present and operating in the year 1871. It was then in response to a certain zeitgeist, as it came later to be called, that Eckley B. Coxe, R. P. Rothwell, and Martin Coryell sent out the call which resulted in the formation of the American Institute of Mining Engineers, now the American Institute of Mining and Metallurgical Engineers. Up to 1871, there had been in America but one national engineering society, the American Society of Civil Engineers, founded in 1852. Its members included all engaged in civil as distinct from military engineering, but because their interest centered in canals, roads, railroads, and other matters above ground, the men who were to bring out the great stores of minerals that have since dominated our whole national life were largely without a professional home. This was all the more true since our mines had been mainly opened and our smelters built by self - trained men who learned somewhat expensively, as they produced. A small but notable band of European trained engineers were, it is true, engaged in mining, but the greater part of the techni-



H. Foster Bain, Secretary of Institute

cal operations were under the direction of men who had not had the benefit of any technical education and had little or no opportunity for contact with even such technical literature as was then being created here or brought in from abroad. Columbia School of Mines and Massachusetts Institute of Technology were yet young, and the men who came home from studies abroad were trained in European methods and largely unfamiliar with American conditions. Between such men and the practical miners, smelters, and ironmasters there was a great gulf that needed to be bridged if the United States was fitly to develop its heritage-and it has ever been the job of the engineer to build bridges.

It was in response to this deep need that the Institute was created, and it was significant that the call for it was signed by two men trained abroad in engineering and a third who had learned in the works. Coxe, one of the ablest of our early leaders in engineering, had studied



Samuel A. Taylor



J. V. W. Reynders



P. N. Moore



E. P. Mathewson



Sidney J. Jennings

MINING and METALLURGICAL ENGINEERS

By H. FOSTER BAIN

Institute Was Created In 1871
To Meet A Deep Need And Has
Steadily Grown In Influence
And Importance—Its Record Is
An Enviable One

at the Ecole National des Mines in France and later at the Royal Saxon Mining Academy at Freiberg. Rothwell, after getting his general engineering education at our own Rensselaer Polytechnic, had also specialized at the Ecole des Mines. Coryell, the first secretary of the Institute, was a self-taught pioneer with a keen sense of the value of learning. David Thomas, the first president, was also self-taught as to technology, but one of the great early ironmasters of this country. R. W. Raymond, who early joined the movement and who for so long contributed so greatly to establish and develop the Institute that it is more closely associated with his name than any other, was another Freiberger. And so the list runs on, a close union of the scholar and the practitioner working together that each should learn from the other.

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The call-sent out from Wilkes-Barre stated the two principal objects to be accomplished to be: (1) The more economical production of the useful minerals and metals; (2) the greater safety and welfare of those employed in these industries. It was further stated that: "In European countries, where the arts of mining and metallurgy have long been the subject of most careful study, no means have been found so effectual in attaining the end above proposed as the free interchange of experience among

those actually engaged in these industries, and the object has been accomplished mainly through the medium of institutes, associations, or societies composed of those engaged in these occupations, and by the periodical publication of essays or papers communicated to such societies by their members."

This was the ideal set up, and through the more than half century since the first meeting practice has followed it closely. No one will ever be able to say surely how much of the great mining and metallurgical development of this country has been due to that habit of free and continuous interchange of data and experience that is now so characteristic and which the Institute has done much to foster. It is a common observation of European visitors that in this we have now gone much further than those from whom we took the idea. Neither can one measure accurately what it has been worth to the country to have recognized as fundamental in our professional societies that there can be no caste lines and no other basis for participation than actual knowledge however attained, and a thirst for more. This insistence on the equal validity of experience as yet not reduced to formulae, and of learning from books and research laboratories, has certainly been one of the most powerful factors in the success of the Institute and of American industry.

Another important factor has doubtless been the habit of looking at things broadly. At the very first meeting of the Institute there were present representatives of coal mining from Pennsylvania, of copper mining in the Lake Superior region, a chemist and metallurgist, a professor of mining, two representatives of the Engineering and Mining Journal, and Dr. Raymond, who, at the time, was mainly known as mining commissioner for his reports on the Rocky PAST PRESIDENTS OF THE INSTITUTE

Mountains and California. Such diverse subjects as mine ventilation, waste in coal mining, distribution of the mining districts, and speed of stamps were discussed. At the meeting in New York in February, 1928, with 42 sessions and 177 technical papers and reports of technical committees, subjects as widely separate but no more distinct were on the program. From the first meeting to the latest an open forum has been maintained for presentation and discussion of any subject related to the technical methods of mining and metallurgy. The 75 volumes of transactions that have been published, and which will be found in the great libraries around the world, comprise the best compendium on these subjects extant.

The Institute early resolved to steer clear of political activities and subjects and to avoid lending its influence to particular projects. It was felt that other organizations existed or would be called into being to further such objects and that for itself it could be most useful by maintaining an open house where all could get together to discuss those things that make for progress in methods. At various times, however, as need arose it has aided in the awakening of interest in matters outside its immediate field but related to mining. In furtherance of its purpose to promote the safety and welfare of those in the mineral industries. for example, it devoted energy for a time to mine safety. With the firm establishment of the National Safety Council, the Joseph A. Holmes Association, the Bureau of Mines, and the many active agencies in that field, the Institute finds less and less need to promote programs and publish papers exclusively on this subject, and particularly those that preach the old rather than announce the new methods; and many such papers are needed. Similarly, The American Mining Congress and other agencies have grown up and prospered, occupying a field which the Institute could not cover save by uneconomic diversion of energies and funds.

From the original 46 the Institute has grown to a membership of nearly 9,000. of whom about one-fifth live abroad. Mining engineers are a roving lot. The world is their field, and cvanide does its work in recovery of gold equally well in Nevada, Transvaal, or Japan. Transactions, therefore, make a worldwide appeal and the Institute, American in name and spirit, is, in fact, at home everywhere. It is organized in two semi-Technical Divisions maintains 22 Technical Committees which watch progress each in its own field and arrange for papers, discussions, and symposiums as the material available warrants. Local sections are kept up in 27 different districts. Each has its own officers, rules, funds, and programs. Delegates from each are brought together yearly at the time of the annual meeting in New York, and the nominating committee is dominated by the representatives of these sections as such. actual business of the Institute is controlled by a board of 24 directors chosen by districts but elected by national vote. Headquarters are maintained in New York, where the Institute is one-fourth owner in the Engineering Societies Building, 29 West Thirty-ninth Street, a property which with various trust funds held in common by the United Engineering Society for the four Founder Societies is now valued at \$3,330,267. In addition, the Institute has invested securities of its own to a value of \$214,000 and a total equity amounting to \$792,927. every member who joins, while he pays only \$20 initiation fee, receives the benefit of a pro rata equity of nearly \$90. Owing to the generosity of various members and the care with which its funds have been handled, it is possible for the Institute to spend each year for the benefit of each member considerably more than the maximum amount received from anyone. The principal expense is for publications. The Institute maintains, in addition to the Transactions already mentioned, a monthly journal, "Mining and Metallurgy," and Technical Publications, a series of individual pamphlets classified by subjects. It is from the Technical Publications that material is drawn for the Transactions, and also, largely, for the two other volumes now published, one of which records annually he proceedings of the Institute of Metals Division and the other "Petroleum Development and Technology," as reflected from year to year in the programs of the Petroleum Division. These two great divisions, each with more than 1,000 members, hold meetings of their own and also participate in the annual meeting each year in February. From the earliest days field meetings and excursions to mines and plants have been a feature of

Institute activity. Regional meetings are a regular part of its program and are held in various parts of the country under the auspices of different technical committees and local sections, either independently or in cooperation with some society of related purpose. That held at Salt Lake City in August, 1927, by the Utah Section and the Milling Committee, jointly with the Western Division of the American Mining Congress, was notably successful. The papers and discussions, which dealt mainly with flotation problems, are to be issued as one of the special volumes of the Institute.

While the prime purpose and main work of the Institute is the increase and diffusion of technical knowledge, the good of the whole industry is kept steadily in view and a place exists in it for every person interested in mining and who is willing to contribute his share to the common pool of knowledge. Members, associates, and junior associates are all recognized and welcome, and in addition there are 41 affiliated student societies in the technical schools. The technical meetings are always open to any visitors who may be interested, and guests are freely invited to participate in its excursions and social meetings. The Institute welcomes those who will derive benefit from its membership but makes no effort to enlist others. To belong is to be one of the great group that has built and maintains the fundamental basis of our present civilization—the mineral industries.

A. I. M. E. ANNUAL MEETING

WITH an attendance of more than 1,400 and a program well arranged and wide in its scope, the annual winter meeting of the American Institute of Mining and Metallurgical Engineers in New York City, February 20 to 23, goes on record as probably the most successful held by that body.

The technical sessions lasted four days and included the presentation and discussion of papers on iron and steel, coal and coal products, mine ventilation, mining methods, ground subsidence, mining geology, non-metallics, geo-physical methods of prospecting, and engineering education. Sessions were also held by the Institute of Metals Division and the Petroleum Division.

The feature of the annual banquet the evening of the 21st was the presentation of the Saunders medal to Herbert C. Hoover in recognition of his contributions to the progress of mining engineering. The James Douglas medal was presented to S. G. Blaylock and the Robert W. Hunt medal to John A. Mathews.

In acknowledging the awarding of the Saunders medal, Mr. Hoover said in part:

"No one could fail to be gratified to

receive so profound an approbation in his calling from the members of one's own profession. To have received this distinction from men, many of whom have been professional associates and friends over more than a quarter of a century, warrants a pride and satisfaction that could come from no other source.

"The long friendship I have received from Mr. Saunders and the distinguished service that he has contributed to the mining industry add to my appreciation of this event. * * *

"Engineers have made magnificent contributions to progress. The gradually decreasing hours of labor, of greater stability of employment, of lessening sweat and drudgery from men, the widening comforts of life, the increased standards of living, the enlarged vision and opportunity to the individual, the stimulative to initiative and invention, are to no small degree the product of the engineering profession. And the engineers have come into a wider responsibility than solely the application of their technology-more and more the engineers themselves are the actual administrators of great industry. To them comes more and more the human problem of relations between employer and employe, the relations between producer and consumer. The mind trained to regard the consequences of action in their human results bids fair to be the largest of the contributions of the profession to

"As our population grows in numbers, as our problems become more complex, so does also grow the need for wider and wider vision of the engineering profession. Our problems of transportation, of housing, of power, of communication, of economical use of our natural resources, of safety and protection to our people, now require long planning in advance. We no longer have a right to think in terms of our generation. A greater America for our children will in large degree depend upon the engineering profession."

An excursion was arranged the morning of February 23 to the Perth Amboy plant of the American Smelting & Refining Co., with a stop-over at the Holland vehicular tunnels under the Hudson River.

At the business meeting it was announced that Dr. George Otis Smith, director of the U. S. Geological Survey, had been elected president for the ensuing year.

Secretary H. Foster Bain announced that a joint meeting of the Institute and the Western Division of the American Mining Congress would be held in Los Angeles in October, and that a visit to Newfoundland was also planned in the autumn.



INTERNATIONAL CENTRALIZATION as SUGGESTED by the GENEVA ECONOMIC CONFERENCE

By A. CRESSY MORRISON *

mists and other representatives from all nations. The conference was called to discuss questions of commerce, industry, trade barriers, international cartels, and agriculture in its relation to industry. One idea developed at the conference was termed the "Rationalization of Industry."

N May of 1927 I

had the good for-

unofficial observer at

the Geneva Economic

Conference. The

League of Nations had

devoted a year and a

half preparing for the

conference, and had in-

vited a selected list of

distinguished thinkers

and writers in differ-

ent parts of the world

to compile data for the

gathering of econo-

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President Coolidge, upon request, sent five American representatives; like members were also sent from other countries. The League reserved the right to select additional delegates from the different countries representing various organizations. Fifty nations were represented by about 400 delegates and experts.

As soon as the conference organized, it divided into many committees upon which each nation might have a representative if so desired. Not being a member of the League of Nations, the United States did not desire representatives upon some of the committees.

You will be interested to know that the international sessions at Geneva are not nearly as orderly as meetings of the majority of commercial bodies in the United States. There are so many races, people, and languages involved. Those who do not understand the speaker immediately begin talking loudly, and no one is able to comprehend what is being said. It was my idea that the League would be a very dignified body where diplomats in uniform or formal dress

From the viewpoint of an unofficial observer at the Geneva Economic Conference, Mr. Morrison presents some interesting facts on the international situation, particularly in reference to Centralization, Cartels, and the Tariff—The Editors.

would rise and address the assembly, which would listen in rapt silence.

The official languages of the League are English and French. A Frenchman makes a vigorous speech with all the emphasis of his nature and with that eloquence which is proverbial among the French. He meets with tremendous applause from those who understand French. Immediately after him a translator rises, who says: "Monsieur So-and-So has spoken as follows-" and then, to the utter amazement of those who are unfamiliar with the real brilliancy of these translators, he will repeat the speech that occupied 30 or 40 minutes, and not miss a point. If he is speaking in English, translating it from the French, all those who understood French begin to talk at once, and the poor English listener is hardly aware of what is being said by the translator, and I may well say vice versa. These meetings, therefore, are not the dignified and wonderful things which one would expect.

I emphasize this particular characteristic of the League of Nations meetings

The League of Nations in session

because I want to illustrate the pointthat it is not a body of supermen. The delegates are ordinary human beings. They have the same frailities, the same standards, the same selfishness, and the same schemes, and indeed the same generosity and general decency which humanity in general possesses. It is a composite of humanity. As a nation is a composite of its

citizens, so when a nation sends delegates to the League they are more or less a cross section of its average intelligence. So the League of Nations is the average of the intelligence of the nations which compose it.

Now, that disposes of a prevalent idea that a gathering of the League of Nations is necessarily always right or always wrong. It is human, and the human equation is just as apparent there as anywhere—vindictive responses, lacking entirely in diplomacy, and earnest, sincere men advocating theories they believe to be new but which have been accepted in other countries for years. It is a most interesting study.

As it seems to be a universal opinion in Europe and other countries that the United States is unduly prosperous, so is there a united sentiment that anything which can be done to distribute our prosperity throughout the world, and advance other nations by tapping our sources of income, is a perfectly normal and proper thing to do.

The organization of the League of Nations is very complete and, as in many great bodies where there is wide divergence of opinion, the steam roller is also present. I want to emphasize this steam roller without questioning or criticizing it, except as it applies to the United States.

All the documentary preparation for the economic conference was necessarily

^{*} Union Carbide and Carbon Corporation, New York City.

in the hands of the officials of the League Their point of view being international, then the documents prepared are likely to be international, because they select sympathetic writers for the preparation and so the documentation of the Economic Conference, amounting to about 120 volumes, all prepared in advance and costing approximately \$100,000 of the League's money, had a strong international tendency. There were long and emphatic statements about universal brotherhood, the love of your fellow man, mutual dependency of nations, and so on, all highly altruistic. This was a part of the steam roller designed to color the thought of the delegates.

The chairmen of the committees, I am perfectly sure, were designated before the conference convened; and were more or less in sympathy with the purposes of internationalism which the League had in view. I am not criticizing that.

The resolutions were prepared in advance and submitted to the committees for consideration. Of course, they were considered, but human experience develops the fact that there is almost always a majority affirmatively inclined towards a well-written resolution. Mental laziness prevents many from rising and criticizing the verbiage of a resolution which has already been prepared, especially since men have confidence in their committees. The fundamental basis of the resolutions, the thing on which the outcome depended, was evidently prepared in advance. In the end, those delegates who wished to oppose a resolution were almost always in the minority. As a result, the fruit of the conferences and the outcome was largely the result of the determination of the League of Nations to bring about in the conference an international point of view; to destroy nationalism and to substitute a universal brotherhood of nations may be ideal, but the millennium is not yet here. The New Testament teaches "brotherhood," but we still have policemen.

Every one of our own delegates at the conference was sound in his Americanism. On many things they did not vote, especially where it involved an investigation or an expenditure of money by the League, and the American position was very sound, for they could not well vote on a subject that involved expenditures from a fund to which we do not contribute.

Our delegation found many things in the resolutions, evidently inserted with direct reference to us or for the purpose of propaganda in the United States. Many were eliminated. In one case, an American delegate who was a minority of 1 against 52 opposing a clause in a resolution, had the courage to say: "If you press this matter which is contrary to the interest of the United States, as I



A. Cressy Morrison

see it, I shall be obliged to bring in a minority report and precipitate a debate on the question before the conference." That seemed certainly effective, and the wording after long debate was apparently eliminated; but when the report of the committee was printed the next morning, by some inadvertence the objectionable clause was still in the resolution; and it required still more courage for that American delegate to go to the chairman and say to him: "I have discovered a typographical error in the report, and unless it is taken out before it is presented I will renew my objection by making a minority report and will bring the error into public discussion."

So you will see how difficult it is for any nation, and more especially the United States, to meet the majority opinion and be courteous and friendly, without yielding something to this international idea when in our hearts we feel we should not yield.

I have given this picture of the League of Nations so that you may see that the League differs in no particular from other great bodies of men wherever they get together to discuss important matters. As is human, they, too, are more or less steered; it is the same thing we find anywhere. That disposes of the League of Nations as a superbody, and I am sure that anyone who will go there and observe it as I did in connection with its inner mechanism will feel that way. In my opinion, whether the propaganda charges us with isolation or not, it makes little difference. If we become bound by the rules of the League of Nations we will find ourselves, step by step, yielding to the majority. We are a good-natured. generous-minded people; and with organization and a majority against us, the situation would be dangerous. It is my opinion that the United States should stay out of the League of Nations.

Many of the keynotes of the League are obvious statements. If I were a politician I would always deal in obvious statements, and then the most of my hearers would agree with me.

For illustration, here are some of them: "It is generally conceded that "the greater the international interchange of products best and most economically produced' in different countries should therefore be regarded as the normal rule." This, of course, means free trade. But the human equation enters, and certainly France, with her standard of living, could not abandon the making of silk and pottery and give this business to China or Japan, nor would those countries give France any return unless her prices were lower than other nations.

Again, England could not abandon the manufacture of dyes and chemicals to Germany on both military and commercial grounds; nor could she entrust a monopoly in such things to any other country and be sure that the higher prices of dyes would not make her production of textiles competitively impossible.

Here is another obvious statement: "Human brotherhood is growing, and in human brotherhood lies our opportunity for future progress and the growth of civilization." Well, that is true basically whether we are white, black, yellow, or red. We are of the same humanity, and we have evolved along similar lines; but our standards differ enormously, and we can not sacrifice them; nor can we adopt the methods of life, morals, or economics of some of our brothers.

Another: "You can not sell unless you buy." Well, that sounds perfectly sound and obvious, but there is much to be said on the other side. Such general statements are hard to answer and it takes patience and time and no little ability to do it. The League's attitude all the way through was based upon these generalized statements.

"Rationalization of industry," which is meant quantity production, automatic machinery, system, and great capital investment, became a subject of much discussion. There was a clear understanding that a great deal of the industrial progress of the United States was due to this policy. The efforts of the American people to standardize products so that rationalization could be attained and the extraordinary reduction in man power per unit of output was recognized. The League was apparently unanimous in the opinion that Europe, if it wishes to succeed and compete successfully with the great country across the seas, must adopt this magic rationalization.

All through the discussions of rationalization were long arguments to the effect that the introduction of new machinery was dangerous to the working man; that





Wheat harvest in Hungary

Photos © Henry Miller Tapestry weaving in Germany

if they started rationalization by improving their products or getting a larger production per man it would increase unemployment; and therefore provision must be made, and subsidies provided, for the idle laborers thus thrown out of work, until consumption caught up.

Now, we in America have passed beyond that. Labor in this country knows perfectly well that the introduction of a new machine means more business for the employer and more work for themselves at higher pay. But over on the other side they still show by their debates that they are in the old state of mind. That may not be the feeling of all, but it is the state of mind of many of the delegates.

We see that the average opinions of the other nations are a generation behind us in this matter. But they are awakening, and the time is coming very soon when rationalization and the adoption of American methods will be general. American machinery is now purchased and copied so that in certain industries, like window glass, they are beating us with our own tools. It is going to increase their competitive ability most materially. They are still in the stage where they feel that low cost labor reduces the cost of production and that the way to save money is to take it out of the human hide. Fortunately we have gotten beyond that, and the producing power of the American people is the key to our progress. I hope we can maintain wages in this country and if necessary pay higher ones. Certainly we should pay wages commensurate with our standard of living, and continue to use our genius to improve our processes, and to bring about further savings in man-power cost.

ON THE QUESTION OF AGRICULTURE

At the Geneva conference agriculture was recognized for the first time side by side with commerce and industry. Its problems must be solved with the others.

But we Americans had paved the way for that, for when we framed our own Tariff Act of 1922 we recognized that the raw material of one man is the finished product of another. We recognized the farm as a producing industry. It is just as difficult to raise a Merino sheep as it is to make cloth and an overcoat from its wool. The man who produces sheep is just as much a manufacturer as the mill owner. That idea seemed to be just born in Geneva, although we have had it over here for some time. So agriculture was recognized as an integral part of the industrial structure of human life and civilization, and entitled to equal compensation and equal recognition. It seemed to be acknowledged as a deplorable reality that in all of the European countries agriculture was not prospering in the same measure as industry. Our own country recently has been no exception to the general rule. But there the comparison ends, for in our own country agriculture has attained a position of importance, incomparably better than that of the farmer of Europe, who has absolutely no voice in the councils of the nations and is only a peasant.

If our farmers could only visit Europe and see the return for effort and the standard of living of the peasant farmer they would learn much by the comparison and would conclude that their lot here is not so bad. Our farmer should still try to better it, but he should hesitate to change our great national policies, like the protective tariff, lest he destroy himself.

CARTELS

Now comes the question of cartels, and that I presume is the key point to which I am to address myself. You will be interested to know that the ultimate conclusion of the League of Nations was this: They do not know whether the cartel is a good thing or not. Let me explain that "cartel" is their word in Europe for a trust or monopolistic organ-

ization, which may be national or international.

Here in our country, as is well known, we are not allowed to form monopolies or combinations to raise prices or to divide markets. The Sherman Antitrust Law has for years forbidden that, and our country has thought it wise to continue to do so. Here we know what riotous competition is and what its dangers are. At Geneva we were told that we are stripping our natural resources because riotous competition forces us to take only the cream from our mines, our forests, and other exhaustible natural resources. That is certainly a detriment to future generations, but for the present at least we can not help it.

But over in Europe cartels have been encouraged. Prior to the war Germany had the enormous advantage of rapidly growing industry and governmental recognition or encouragement of cartels. Agencies of the old German Government in foreign countries were charged with the duty of ascertaining the nature of imports from other countries. In Brazil, for illustration, representatives of the German Government were everywhere, in banks and other clerical positions, acquiring information regarding contracts and trade relations with other countries, so that the information might be transmitted to Germany and there acted upon by the cartel for the benefit of German commerce.

An American concern sent a man to Brazil who made contracts with the leading dealers in his particular commodity. The contract bound him to furnish all the items of that commodity which they could normally handle. The contract was large enough to involve the question of loans, and as a matter of course the local dealers went to the banks. The banks copied the contracts and sent them to Berlin, and inside of 60 days a German representative of the cartel came to Brazil, saw the other dealers, and cut

the price sufficiently so that the original firms could not compete. The American manufacturer was confronted with the necessity of either cutting his price to a ruinous degree or going out of the business there. In those days Americans were not particularly interested in export business, and the manufacturer did not cut his price, and his business in Brazil was lost.

These methods are not exactly ethical and I do not say that Germany is the only one who did it. A chicken like that might some day come home to roost on our own rail. At the same time, a cartel is in a much better position to conduct such a fight and drive competitors out of business than is a single individual concern.

Now, those prewar cartels were very successful. We have heard it said, and believe it to be so, that if the German Government had been less inclined to war and more patient, the German method of competition would have made Germany the commercial leader of the world by this time. But, of course, the war came and Germany lost. She lost territory, personnel, training, and methods of government which were effective in this case. It will take that country, and every other country in Europe, some time to reorganize and reestablish old connections and build up their trade again.

But the cartel idea is not dead, and when it came up at Geneva the conference said that there was no law which could control an international cartel; that no law could be made until cartels had demonstrated their usefulness or lack of usefulness, their dangers or their benefits. So national cartels were recognized as established facts and international cartels were considerably encouraged. The League in general terms said: "If a cartel does not raise prices internationally, if it does not discriminate against nations by charging a high price for a necessary commodity to be used in a further commodity, and thus drive that nation out of the competitive field on the further commodity, the cartel would be all right. That if it did not throw workmen out of employment it was all right. That if it did not work them too hard it was all right." But the curious thing about it was that the international cartels were discussed with the same arguments which we find took place in our own Congress when we reread the debates on the Sherman Antitrust Lawagain showing that we have passed through much that seems new to many other nations.

Although the League reached no conclusion about cartels, yet nothing was done to discourage them. Cartels were then and there in process of formation. Last summer the "Chemical Cartel" was formed internationally. I met people in May who were interested in it and asked,

"Have you signed? I see that German chemical stocks are rising." They answered, "No, we have not signed, but conversations are still going on." Later the great "Chemical Cartel" was formed.

The difficulty in forming cartels is that the initiators usually demand the greater share of the business. When the cartel divides the world's business, for instance, it may be suggested that Germany shall have 50 percent, France 22 percent, Holland 16 percent, and Luxembourg 6 percent, and so on. These percentages present great difficulties as to who will share and how much each will get.

Cartels divide up the countries on the theory that if you control production you can thus raise prices and prevent destructive competition. Back of the whole thing lies this idea: That the cartels will be better equipped to give successful combat to American industry. strength of the cartel lies in its centralized control and in its ability to dump or to exercise the kind of competition which will force its competitors out of a neutral market. I believe it is their underlying hope that the increase in American exports may be checked, or in fact radically decreased by the efforts of these organizations.

I was astonished to learn that national cartels are so general that they cover almost all industries. International cartels are less so, but I am told that when the World War broke out there were some 600, and they have increased rapidly ever since.

Which is the proper method of doing business? Of the two systems, which will succeed? A concentrated body organized for international trade like a cartel, or a concentrated body like the great corporations in the United States? Certainly the small fry must keep near the shore. I do not think the world has as yet demonstrated which is the best for humanity generally. That is a matter for discussion. It is trust and antitrust, and I think we may dismiss that question because we can not settle it here.

These international cartels have weaknesses, and that is the same thing that I have illustrated in the workings of the League of Nations. They are made up of human beings, and my observations confirmed my feeling that Europeans, both as nations and individuals, are not more generous nor less unselfish or highminded than the American people.

We know there is a very large class of people in the United States who feel that anything our Government does is absolutely wrong. For instance, if we send an ambassador to Mexico who asks Mexico to protect American business interests there, some one is bound to rise and complain that it is not right; that we are trying to interfere with Mexican business and the Mexican Government. If we do not send an ambassador to look

after these matters in Mexico, we are then charged with being a neglectful Government. If we go into Nicaragua because we want to protect Americans there, many in this country at once declare we are utterly wrong, are imperialistic, and have ulterior motives. They charge we are creating ill will for our Government, and that we ought to at once withdraw. If we try to do anything to protect Americans in China because there is no strong government in China and no one able to protect us there, some one jumps up and says we are brutal and are helping others to rob China of its independence.

THE TARIFF AND THE LEAGUE

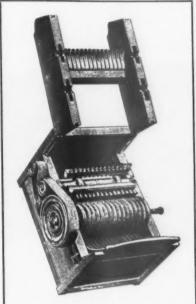
Much of this unthinking criticism is directed at the American tariff. How many thousands of people in the United States think the American tariff is wicked, that it is a menace to peace, that it prevents the whole world from recovering from the war, and that we are ungenerous and unkind to Europe! How many of these critics, either Americans or Europeans, know that 60 percent of all goods coming here are on the free list; that our imports are double those of any previous time in our history, and that more goods come in free today than the total of all imports under any previous law? Well, I found this ignorant criticism in Europe. I talked with a man from Finland who said: "Oh, Mr. Morrison, I wish to speak to you about your American tariff. It is hampering our development." I asked: "In Finland?" I said: "The American people are very friendly to Finland and are proud of the fact that you have organized a government upon the American model. That we are doing anything to upset the commercial relations between these two countries, or do anything that is distasteful to Finland, is a surprise to me. Please be specific." Now, gentlemen, that is the key to the whole situation-let the critics be specific. He said: "It is your tariff on lumber and wood pulp." I said: "Why, I am astounded that should affect you, because both are on our free list."

Then I met a Canadian who said: "Your tariff is very, very bad." I said: "What makes you think so?" He said: "Lots of my friends in the lumber business in Canada are almost bankrupt." I said: "Wait a minute. Lumber is on our free list." He replied: "No, there is a duty of \$2 per thousand." So I took my copy of our tariff act, and after reading it to him I said: "There is a duty on one kind of lumber, on planed tongued-and-grooved boards, of \$2 per thousand. And the reason for that duty is because Canada charges us a duty of \$2 per thousand feet. There is a clause in our tariff bill which says we will put lumber on the free list if the other nations permit our lumber to enter their markets free. In the case of Canada, I know that an application has been made to the Canadian Government to take that \$2 per thousand feet off of that particular ciass of lumber. So you understand the moment your country takes off its tariff, then our tariff falls. Your complaint is not against the United States. Go to Ottawa and have it corrected there. This is just another instance of foreign misunderstanding of our tariff.

In Europe they thoroughly believe that we have a tariff wall so high as to prevent anything from coming over here, and that it is almost impossible to export anything to us. None of them know the fact, as I stated a moment ago, that 60 percent of all imports coming into the United States under our present tariff law are free, and that a tariff is put upon those commodities in which a large amount of labor is used in production, so as to keep our own people working instead of throwing our workmen and women out of employment and giving their jobs to the workmen in Europe. So there is a very strong sentiment, and it results in propaganda which is ever increasing. Indeed, much of this propaganda emanates right in Geneva from certain American organizations, with altruistic ideals and supported by American philanthropy, who preach that our self-preservation by means of a tariff is "a menace to world peace." I have innumerable instances of that sort of matter in my possession. All the European nations have organized press bureaus which are sending alleged national opinions to our press and, strange to say, criticisms of America and our policy get the headlines here in the States.

NATIONAL OPINIONS

And this brings me to this thought: These "national opinions" seem to come into our public prints as though they were the opinions of the peoples of these foreign governments. The propaganda is like this: "It is the consensus of opinion in Germany"; or, "English opinion is as follows"; or, "France thinks so and so." Who knows what France thinks? Who knows what the consensus of opinion is in Germany? Who knows what English public opinion is? Do we think we know because an Associated Press dispatch tells us this or that? There is no referendum. Somebody says "France hates us." Shall we believe that? I think France loves us, and my opinion is as good as a reporter's. I think there is no lack of appreciation in France of the fact that we went "over there." They helped us in our struggle for independence and we came to them when they needed us most. Do you think the people of France hate us because of our tariff, of which ninety-nine out of a hundred Frenchmen never ever heard?



It is said that the cotton gin, by making slave labor profitable, did more than any other one factor to bring on our Civil War. That new machinery and machine production enter international politics is pointed out in this article

But the propagandists say that France made this last attempt to raise duties against us because she wanted to get even with us on account of our protective tariff. You should know that all the European tariff walls are about as high as ours, and many exceed ours. There is not nearly as much on their free list as you would suppose.

Why should we accuse France of reprisal? How do we know what "France" thinks or why she acts? I was once told by a diplomat that if one could tell tonight what the French Government will think tomorrow morning he would surpass the greatest intellectual achievement of the century. Let us analyze this question of reprisal: Shall we say that France "thinks" this or that, and because of the American tariff she prefers to buy goods elsewhere? Is the American tariff as serious a menace to France as the German border line? Germany has been her hereditary enemy, and for generation after generation the French and the Germans have distrusted each other. On the other hand, can you tell me France has entirely forgotten our services to her and the friendly relations which have always existed? Is it because of our tariff or is it for some other reason she has made a reciprocity treaty with Germany, her worst enemy, and tried to raise her tariff against us? You may guess what an individual thinks, but no man can tell what a nation thinks. That is what I am coming to in this whole question of

international relationship. France may think one thing or she may think another, but the individual in France who is engaged in the grain business "thinks" that if he can buy wheat from the Argentine 1 cent cheaper than he can in the United States, he is going to buy in the Argentine. And if he can buy wheat 1 cent cheaper in Russia than he can buy it in the Argentine or in the United States he is going to buy it in Russia.

We must not expect the individual business man to sacrifice his profits simply because he "thinks" what a wonderful, generous country the United States is, or will say, "How good it has been to us; I for one appreciate it, and therefore I am going to make the sacrifice."

We can take it as axiomatic that the purchasers in all European nations are going to buy what they can within their own borders, and if they must buy from other countries they will buy where they can buy cheapest, and nowhere else. And if they find there is something coming across their borders in serious competition with them, they will devise some means to protect themselves; a tariff, or a classification, or whatever may be necessary.

No matter what we do in America, whether we loan them money to start their industries (as we have done enormously, and thus helped them to build up competition against us) or whether or not we set aside a tariff duty, it is individual American initiative and ability that is going to determine whether we get foreign trade or not; and it is our competitive ability to produce at a lower cost and sell better goods or cheaper goods that will get us the business. Let us not adopt as a commercial principle the idea that we may expect gratitude in our business relations with the people of another country. One of the great philosophers put over his dressing table:

"Never expect gratitude. If it comes it is as a gentle rain from Heaven, and it is as rare as a shower in the desert."

Quite apropos of this is a recent statement in Le Temps, a leading Paris paper, which refers to our "Holier than thou" attitude, and adds: "At the feet of the Pharisees this attitude must be seriously considered, for they are only too willing to walk over those who prostrate themselves before them," and says further regarding America: "While waiting for a powerful war fleet under hasty construction she is blocking all the seas in order to hold the Old World at her mercy. She is throttling it with chains of gold."

This is a responsible French journal, and the information given is news to us all. I do not believe you knew our country was half as bad as this.

(Continued on page 193)



U. S. Bureau of Mines Photo Typical oil and shale formation near De Beque, Colo.

HE oil shale industry in the United States is in its pioneer stage and has not yet been established commercially. After 10 years of constant attention and careful study, it is my belief that the oil shale industry can be established in a commercial way in the United States. I believe that it will become one of the foremost industries and that the time has come when the subject of oil shale should be given the earnest attention of those interested in the future commercial welfare and prosperity of our country.

It is my purpose to briefly discuss the extent and characteristics of the deposits of oil shale in the Rocky Mountain States, the difficulties with which the industry has been confronted, the problems yet to be solved, and the results which we believe can be secured.

EXTENT AND CHARACTERISTICS OF THE DEPOSIT

There are about 4,000,000 acres of shale land in Utah, Wyoming, and Colorado, which lands have been classified by the United States Geological Survey as chiefly valuable for oil shale. One million acres of this oil shale are situated in Colorado. The oil shales occur in what is known geologically as the Green River Formation, which is one great deposit of oil shale and carries more or less of oil-bearing minerals throughout its entire thickness. While the formation is probably uniform throughout Utah, Wyoming, and Colorado, in the De Beque-Grand Valley District of western Colorado, where the best oil shales occur, this formation in its entirety has a thickness of from 2,700 to 2,800 feet. Systematic samplings at various places show that some horizons of this formation are very lean in mineral content, but the zone occupying 500 feet of the lower part of

the upper half of the formation contains the richest shales, and it is in this part of the formation that the mining operations will be carried on.

DIFFICULTIES WITH WHICH THE INDUS-TRY HAS BEEN CONFRONTED

The difficulties which have confronted this industry have resulted very largely from inadequate knowledge and a lack of correct information of the entire subject matter.

Titles.-Before 1920 the shale lands were subject to location under the placer mining laws and about 150,000 acres of land were located in the State of Colorado in accordance with these laws, before the passage of the leasing law, February 25, 1920. The requirements under the placer mining laws had been well established over a long period of years by many judicial decisions and the formation of clear rules and regulations by the Department of the Interior defining the practical application of those laws. While valid subsisting oil shale placer mining claims were excepted from the operation of the leasing law, that law, in fact, resulted in great confusion, and in an entire change in the policy of the Government in the disposition of these lands. Before the passage of the leasing act, the effect of the proposed law was discussed by representatives of the shale claimants with officials of the Department of the Interior. The same questions were discussed before the Public Lands Committee of the House of Representatives. From these discussions, it appeared that not to exceed 10 to 15 percent of the shale acreage of Colorado would ever pass into private ownership in fee simple, and that the remainder of these shale lands would remain as the property of the United States Government in its proprietary capacity, subject to be operated only under a system of leasing-the terms and con-

The OIL SHALE HURDLES

By D. D. POTTER *

Difficulties With Which The Oil Shale Industry Has Been Confronted Are Serious But Not Insurmountable—A Statement Of Problems That Must Be Solved

ditions of which could only be determined after operations had been established by private enterprise upon shale lands held in fee simple. It was believed by the shale claimants that it was the policy of Congress to preserve the rights of the shale claimants and that their rights should be subject to no greater burdens by reason of the passage of the leasing bill. The department has attempted to lay down rules and regulations properly interpreting the legal effect of the leasing law. As a result of these new rules and regulations, the oil shale claimants have been confronted with innumerable legal questions, a number of these questions have been determined, but there are still other questions to be determined, and it is now hoped that the remaining questions may be clarified and the questions of title settled. These questions of title have made it extremely difficult to finance the work necessary to the perfection of the possessory mining titles acquired under the placer mining laws. While a number of the large oil companies have acquired shale acreage in Colorado, no doubt others would have provided themselves with shale lands except for the fact that they have not cared to become involved in the confusion attendant upon the interpretation of the effect of the leasing law as it pertains to the oil shale

Revolutionay Method of Producing Oil.—While the leasing law resulted in confusion, it resulted in no more confusion than the proposed change in the methods of producing oil. Since the discovery of the Drake well in 1857, oil has been produced by the drilling of oil wells. It is now proposed to produce oil by the mining and retorting of the oil shales. The mining man has not been interested in the shales because he has never before been interested in the production of oil. While the oil man is interested in the production of oil from shales and knows that shales can be retorted and refined, he is not skilled in mining, and for that reason believes that the shales can not be mined at a cost that will allow the production of oil from shales at prices comparable to the cost of producing oil from wells.

PROBLEMS YET TO BE SOLVED

So long as an abundant supply of oil can be obtained from wells, no one will be interested in producing oil from shales, but it is now realized that the supply of well oil is not inexhaustible and, at the present rate of consumption, the domestic production will, in a very few years, be less than our required needs. While we produced 770,000,000 barrels of crude oil in the United States in the year 1926, consumption has kept pace with production, and, in spite of the discovery of many great oil pools during the last few years, we are not now producing enough oil to supply the estimated needs of a few years hence. It is generally conceded that the consumption of petroleum products will continue to increase. We will soon be using not less than 1,-000,000,000 barrels of crude oil annually. It will then be necessary to supplement the production of oil from wells in this country either by importations or from the oil shales. While we will, no doubt, be able to import a very considerable amount of oil from Mexico and South America, it behooves us to consider the means of producing this necessary commodity within our own boundaries.

In Colorado alone the oil shales can be made to produce enough oil to supply all possible demands of the United States for the next 250 years, and it can be produced at a cost not in excess of the present average cost of domestic well oil. From the best available figures on the cost of mining similar materials, the oil shale can be mined at a cost of from 50 cents to 80 cents per barrel. In certain favored localities the glory-hole method can be used, but for the most part the Colorado shales will probably be mined by a system similar to that employed by the Miami Copper Company in mining the porphyry coppers in Arizona. From the best information available, we now know that oil can be retorted by known methods from these shales at a cost not to exceed 80 cents per barrel. Anyone familiar with American ingenuity knows that the present methods of retorting the shales will be greatly improved and that in all probability these retorting costs

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will be greatly reduced. Enough experimental work has been done in the retorting of Colorado shales to determine the fact that a good grade of commercial oil can be produced from these shales.

While a certain amount of reconnaisance work was done by the United States Geological Survey, it has been necessary for the owners of shale lands to make detailed examinations to determine the character and value of these deposits. These examinations have required much time and have entailed great expense, and there is yet much work of this character to be done. However, the work already done by the various private concerns has established the fact that in all likelihood from 400 to 500 feet of this formation will be mined, and that the best shale lands in the Colorado area will yield in the neighborhood of 500,000 barrels per acre.

The United States Bureau of Mines has done valuable work in testing the shales. An experimental plant has been established on the Naval Reserve in Garfield County, Colo. It has been determined that these shales can be retorted by known methods and that they will produce a good quality of oil. While the appropriations have been made for this purpose, the bureau is now without funds to continue its work, but it is hoped that an additional appropriation will be made by the next Congress and that this valuable work may be continued.

RESULTS TO BE SECURED

If the shales are to supplement the production of oil from wells the work must begin, and it must be undertaken in a mammoth way. Mines must be opened, retorting plants established, and pipe lines constructed to transport the oil. To do this in a practical way, it will probably be necessary to employ not less than \$200,000,000 of capital to establish the industry. The expenditure of this sum would provide a production of about 100,000 barrels per day. This production can be multiplied as necessary by increasing the capital invested. The development of the oil shale industry should be undertaken by a number of large oil companies and mining companies with strong financial reserves.

CONCLUSION

In conclusion, the development of the oil shale industry will assure an adequate future supply of oil in the United States; it will safeguard the present investment in the oil industry; it will permit the extension of the mining industry and provide employment for large numbers of mining engineers and other mining men in subordinate capacities. Practically unlimited capital can be profitably em-

ployed. All other lines of industry will be stimulated. Those engaged in the mining industry may profitably consider the subject of oil shale. They should become informed and embrace the opportunities offered, to the end that mining in the United States may take the rank where it belongs among the industries of the country.

OIL COMMITTEE OFFERS PLAN TO REDUCE OUTPUT BY MUTUAL DEVELOPMENT

Recommendations for legislation to permit cooperative development of petroleum pools without violation of the Federal and state anti-trust laws were made public recently by Secretary Work as chairman of the Federal Oil Conservation Board.

The recommendations, drawn up by the committee of nine recently named to consider overproduction and waste problems, have been submitted to the Conservation Board along with a bill proposed to empower the board with the authority to permit mutual development of fields in an effort to conserve the Nation's petroleum supply and prevent waste through overproduction and resultant depression of the industry.

In brief the recommendations were:

"Federal legislation which shall unequivocally declare that agreements for the cooperative development and operation of single pools are not in violation of the Federal anti-trust laws and permit, under suitable safeguards, the making, in times of overproduction, of agreements between oil producers for the curtailment of production.

"Similar legislation by the various oil-producing states.

"Immediate further study into the matter of waste of natural gas in order that legislation may be formulated which will forbid such waste as fully as may be done without working injustice and unreasonable hardship.

"Legislation by Congress granting the Secretary of the Interior authority to join and to permit lessees from the Government to join in agreements for the cooperative developments and operation of single pools.

"The passage by Congress of the legislation heretofore recommended to it by the Secretary of the Interior, removing the existing mandate upon him to offer for lease annually, regardless of conditions, 100,000 acres of Osage Indian lands."

PROGRESS of STUDIES of FEDERAL REVENUE SYSTEM BEING MADE by JOINT CONGRESSIONAL COMMITTEE*

By CHARLES D. HAMELT

Important Policy Problems Considered — Tax System Of Mushroom Growth Unaided By Well Thought Out Plans—Developing Income Tax System For Future Outstanding Problem— Simpler Basic Policies Advocated—Simplification Essential

FOR the seventh time in the past 11 years we are engaged in rewriting the revenue law. The Nation has prospered and the National Treasury has a comfortable surplus. It is entirely proper to make a downward revision of the rates. As on like occasions in the past, however, we

casions in the past, however, we are undertaking also to revise the substance of the law. I wish to raise for your consideration some of the more important problems of policy which confront all of us at the present time.

I have been impressed with two major facts, which are, perhaps, somewhat paradoxical. The first is the high quality of our past achievements in the tax field and the second is the obvious imperfections and shortcomings of our present-day tax system. We have done very well, but not well enough

but not well enough.

During the past decade the income tax has grown from a relatively insignificant source of revenue to one which produces about 50 percent of the ordinary receipts of the federal government. During that decade the income tax was the means of raising a large part of the revenue necessary for a world war. In a very real sense the system may be said to have had a mushroom growth. Moreover, its growth has been the chance growth of trial and error, unaided by well thoughtout plans or definitely formulated programs. An outstanding problem is how best to develop the income tax system for the future.

GROWTH OF THE LAW

It is a great privilege of those in this country and in other English-speaking countries to live under a legal system known as the common law. The common law is based on cumulative judicial experience in actually litigated cases. It possesses remarkable flexibility and capacity for adaptation to changed circumstances and conditions, and has a power to keep pace with the growth of the social and economic life, which has commanded attention the world over. The common law is not a legislative product. It is the result of judicial growth and adaptation. We need more of the qualities of the common law in our income tax law. How can they be attained? Should we endeavor to make the tax statute a statement of general principles (as many have advocated) and leave the technical and complicated details of its application to be worked out by judicial decision? Or shall we continue our present habit of providing for these details as they arise by amending the act? I think this question is of first importance. Frequent statutory revisions complicate the law, make for uncertainty, and keep the administration of the law in a state of

Charles D. Hamel

constant turmoil. On the other hand, it must be recognized that the income tax system has not yet grown to a point where final judicial decisions on disputed questions can be obtained with sufficient promptness to be used as the basis for the administrative disposition of other cases. If time permitted, it would be interesting to trace certain tendencies in this regard, particularly as evidenced by the creation and functioning of the Board of Tax Appeals. I am frank to confess that I do not know the correct answer to this broad and important question. I am convinced that if the present general outlook and frame of mind is retained, we shall have revisions of substance with each rate revision for a great many years to come. The question we must decide is whether all this is wise policy.

CERTAINTY, JUSTICE AND SIMPLICITY

Assuming momentarily the impracticability of an income tax system based on a statute of general principles and further assuming that we will have frequent revisions of the substance of the act, another problem is presented which I should like also to discuss. It is often said, in connection with the drafting of statutes, that there is an unavoidable conflict between certainty and justice on the one hand and simplicity on the other.

The work before the Joint Committee has convinced me that, broadly speaking, there is often such a conflict. It would be very easy to simplify the law by omitting much of the detail now in it and by eliminating many of the special provisions designed to do

cial provisions designed to do justice in unusual kinds of cases. But to remove the detail and to leave only the simple general principles may be to make uncertain that which is now certain. The taxpayers as well as the courts will ask whether the omissions were intended to change the law, and if so, in what respects. Business men will be less able than they now are to forecast the amount of taxes which will have to be paid to the federal government. If the special provisions heretofore inserted to take care of the unusual cases are eliminated, such, for instance, as the complicated provisions governing credits for foreign taxes, hardships will result in the few cases arising under these provisions. In the past the tendency, whether consciously so or not, has been to sacrifice simplicity in the interest of certainty, definiteness and justice, and there is much to be said for this general policy. The result, however, is that the Revenue Act of 1926 is more bulky and more complicated than any preceding revenue act. Thoughtful consideration must be given to the matter of just how far it is wise to sacrifice certainty and justice for simplicity and just where to strike a balance between these conflicting considerations.

SIMPLIFICATION FOR THE SMALL TAX-PAYER

Another underlying problem in revising the income tax system may be mentioned. About 75 percent of all the tax-payers have net incomes of less than \$5,000. They pay in the aggregate perhaps not more than 5 percent of the total tax. The group is important numerically but as a source of revenue it is almost insignificant. The income tax problems of members of this group are relatively simple. Their sources of income are few and arise from well-known trades or businesses, small in size, and often managed by the taxpayer himself. It would be easy to write a simple law for this group, because the sum total of the tax problems which would have to be covered in such an act are not particularly complicated or numerous. One act, however, must apply as well to the 20 percent, whose incomes are more than \$5,000, whose sources of gains and profits are many and diverse, whose business enterprises are vast and complex and whose activities, in many instances, reach to all parts of the country and even to foreign countries. Though few tax-payers with incomes of less than \$5,000 are interested in problems of reorganization, credit for foreign taxes, procedure before the Board of Tax Appeals, technical pro- (Continued on page 166)

^{*}Address delivered before Thirtieth Annual Convention of The American Mining Congress, Washington, D. C., December 3, 1927. † Counsel, Joint Committee on Internal Revenue Taxation.

ACTIVITIES of INDIANA SECURITIES COMMISSION

By FRANK E. WRIGHT *

FTER unscrupulous promoters and high - powered stock salesmen had fleeced the good people of our Hoosier State out of millions of their hardearned savings, leaving many to face old age in an almost penni-



Frank E. Wright

almost penniless condition, the necessity of doing something to curb the activities of these leeches of society was evident to everyone. Out of this public sentiment crystallized our first Blue Sky Law, enacted in 1921, followed by our present Securities Act, which took effect around May 1, 1925, and which has proven so efficient and effective in its workings, preventing so much fraud in the sale of securities that it has served as a model and pattern to several other states of the Union.

During the last fiscal year closing December 31, 1927, the Securities Commission was called upon to determine whether or not bonds and stocks to the amount of more than \$357,000,000 might be offered for sale in this state. Only \$2,463,000 of this amount was rejected, showing the wholesome preventive influence exerted by the commission, which has made the dealer very careful of the character of securities offered for their inspection.

No law has ever been enacted that is entirely foolproof, and all of the laws in the country can not protect the investor who resents protection.

The disease of "get-rich-quick" is probably one of the most contagious with which we have to deal, and most of us are born gamblers, too often tempted by rosyhued pictures of large returns, are we ready to take a chance. The road to wealth is full of chuckholes, and you must drive slow if you would be certain to achieve success. Every individual with investment funds is in danger. Look both ways before you start to cross the street of finance. It is a two-way; and the nice-appearing, flattering stock salesman can get you coming and going.

Disease Of Get-Rich-Quick Is Contagious And No Law Can Protect The Investor Who Resents Protection—What Indiana Is Doing With Her Securities Law

While the fakers and swindlers have had several object lessons in Indiana that have given them a wholesome respect for our law, and their operations are becoming more and more extinct as time goes by, we occasionally run on to one of the old timers who takes a chance of getting away with his high-handed financing. One case that comes vividly to our mind, which would be of especial interest to the readers of this journal, is that of a Delaware corporation which opened up offices in Terre Haute. Several miles away, in another county, they leased a small tract of land on which was located a small vein of coal. Everyone in the surrounding territory knew that there was only a small vein of coal there-not enough to justify the opening of a coal mine in any sense of the word. The new company threw back the earth, exposing the coal to view, not saying anything about the fact that there was only enough there for viewing purposes, began grading for a railroad switch, and proceeding to erect a tipple.

When the work had proceeded thus far they were ready for operations, and inserted ads in distant papers stating that a new coal mine was being opened up and asking for a large number of men to work in the mine. The miners, large numbers of whom were out of employment, flocked to the scene, only to be informed that it was a cooperative mine and only stockholders would be employed, but offering large wages to all who so qualified. Greatly in need of work, large numbers of the men returned home to borrow the \$100 or \$200, or whatever they could pull them for, to enable them to get the work. Returning, they became part owners of the company and were told to return on a certain date when operations would be commenced. promoters worked fast, and while one of them was writing out the gilded stock certificates for the miners and taking their money, another was calling on coal dealers far enough distant that they would not know of the scarcity of coal in the vein and informing them that a

cooperative mine was being opened from which one dealer in each town would be supplied with coal at a figure far below what he was then paying. In each case they especially wanted the man approached as he had been recommended to them as the live dealer of the town, but of course if he did not want the contract his competitor down the street would like to have it, but they did not want to see the other man get the contract and put him out of business by being able to so far undersell him that they would get all the business. As it was a cooperative mine, only as a matter of formality he would have to take \$500 in the stock in the company and become one of them. They gave him no time to think the matter over or to make any investigation, and in several instances, for fear his competitor would get the contract, the dealer bit and paid over his money, only to find out a few days later, in company with the poor miner, that he was flimmed, as the company ceased operations on short order when a member of the commission dropped in to see just what they were doing and at once had issued warrants for their arrest.

In another case, two well-dressed slickers dropped into town and inserted an ad in a Sunday paper inviting anyone having \$5,000 to invest and wanting large returns on their money to address a certain box, care of the paper. Three or four days later an aged widow woman came in to ask our advice. We asked her to tell her story, which revealed how she had been left with \$5,000 and, unable to live on the interest, seeing the ad she had replied. The following morning she was visited by the faultlessly dressed men of pleasing appearance and flattering tongue, who explained to her that they were going to incorporate a company to make moving-picture films that would make at least 300 percent on the investment. She made them think so much of their own mothers and the days they knelt at her knee that they would take her in on the ground floor; in fact, they were so anxious to help her in her lonely old age that they would give her \$10,000 worth of the stock in the new company for \$5,000, then sell half of the stock and give her the money so she would have \$5,000 worth of stock in the company and still have her money back. They were afraid this was not yet good enough, so strongly had her loneliness appealed to their manly hearts, and they agreed to give her a place as manager in the office, stating that her presence would add

^{*}Auditor, Indiana Securities Commission.

dignity to the surroundings for which they would gladly pay her \$50 a week. She had given them a check for \$1,500, as she could not check on the balance for a few days, and in the meantime they called her up every day, as they explained, just to keep in touch with her. as she was one of the company now. As she finished the story in her simplicity saving, "You don't think these men could be crooked, do you? They were so nice and courteous and talked of their mothers and their church," our blood boiled as we thought what if it were our own mother taken in this way; and, needless to say, we determined then and there to see that these men got speedy justice, if such a thing under heaven was possible. In less than on hour they were thinking the matter over behind the bars of the city jail.

Not all cases that would fail are constructively fraudulent. Sometimes the man seeking to sell his stock to the people is sincere and honest in the thought that he has a wonderful invention that will make himself and all whom associate themselves with him immensely wealthy. One case of this kind was the man who asked to sell \$100,000 worth of stock in his company, explaining that he had invented a paddle wheel with generator attached which was to be placed in the small branch or creek running through the farmer's barn lot after a cement dam had been built, and furnish electricity and power for the home and barn. After his enthusiasm had partially run down, a member of the commission asked him what would happen to the contraption when the small stream froze over in the winter or dried up in the fall, as usually happens. His face fell, as he had never taken these items into consideration, and he returned home with his dream of wealth, a sadder but wiser man.

The things that we always take into consideration in passing on any security are feasibility of the plan; the men back of it, are they conservative, practical, trained, and honest; is there a field or demand for it; are the promoters willing to put their own money into it; will it make good, and is the people's money safe in the proposition.

The fact that a bond or stock issue is allowed to be sold is not in itself a guaranty of the entire safety or desirability of the investment for everybody. Some issues we allow to be sold after they are marked in 18-point black-faced type: "This is a speculative security." In such instances we have satisfied ourselves that there is no fraud, but to buy it you are taking a chance, as in the oil well and things of this class. A man of means can afford to take the chance; in fact, possibly gamble on the company striking oil; but for the widow woman, or man of small means, this stock or those of its class should not be considered.

It is a good rule always to investigate before you invest, as our Better Business Bureaus have drilled into our people for so long.

What is the established reputation of the men back of the concern; are they qualified by experience to direct such a business; are they willing to risk their own money in the venture?

How about the marketability of the stock if you needed your money in a hurry; how much of a loan could you get on it if you needed to borrow some money?

No matter how alluring a promoter's or salesman's promises are when presenting the merits of a new enterprise, if your financial position is not sufficiently substantial to withstand a loss remember that a dividend check means very little when you lose the principal.

Steer clear of the proposition offering unheard of large returns. Don't get hoggish and want 10 or 20 percent, and remember that the three big "C's" in investment stand for Carefulness, Conservativeness, and Consideration.

Don't go into anything blindfolded or be rushed into it. Talk to your bankers; nine times out of ten he will give you the right advice.

It is the purpose of the commission always to safeguard the interests of the people first, but in doing so not to assume an arbitrary attitude, and at all times to help and encourage all legitimate enterprises. We sometimes have to be hard boiled, and can do so when the occasion demands; but our rule is cooperation, and we find that the greater percent of the companies with which we deal want to do the right thing, and are ready to change their plans if necessary to conform to the wishes of the commission. Many financial set-ups have been completely changed after we have gone over the matter carefully with the incorporators of a company. In some instances the changes made were not fully appreciated until the parties had time to see that its workings were to the benefit of everyone concerned and in fairness to everyone must be done before we could allow them to sell securities to the people of the state.

A close follow up is made of each application approved, and a financial statement must be submitted every six months so that the commission can tell just what the company is doing and what progress they are making.

It was often a rule in former years that the promoter or stock salesman received a high percent for selling the securities of his company, in some cases reaching 20, 25, or even 30 percent. We have made a radical change in this item, and now 12 percent is the top, with many issues sold on a percentage of 6 and 8 percent and some even down to 4 and 5.

This item alone has saved to the companies as working capital thousands upon thousands of dollars.

In only one or two instances after having their application turned down have companies gone ahead and sold their securities. One promoter, with a wife who was his equal, came into the state, secured a lease on some gravel land, opened some elaborate office rooms, and made application to sell a good-sized chunk of securities in their company. The demand and outlet for their commodity was overstressed, accompanied by two sworn appraisals at a figure that the members of the commission knew were about two or three times too high. In the investigation that followed it was learned that the promoter had back of him jail sentences in at least two states and had been connected with several shady deals of like character. The application was promptly turned down. In a short time information was received that the company was selling stock in their venture regardless of the fact that it was not approved.

An investigator was sent to check up on the matter and promptly had warrants issued for the arrest of the parties. In the trial which followed the chief promoter was sent to the state prison for violation of our Securities Act. We do not take any satisfaction in sending people to prison, but realize that people must be made to respect the law if they do not do so by choice.

No one can sell nonexempt securities under our law unless they are registered either as a dealer or an agent for a dealer and under a bond of \$5,000 running to the state of Indiana. All securities sold in the state, unless exempt under the law, must be registered either by notification or qualification. Companies who have been in business for three years or more and can show for two consecutive years or more a net earning of one and one-half times the interest requirement on stock issued, including the amount to be sold at the time, come under notification which is the shorter and simpler way of registration. In this class also comes all construction issues in which the mortgage loan is less than 70 percent of the appraised valuation and can show a net rental sufficient to take care of all operating expenses, taxes, depreciation and interest, plus 3 percent on the investment.

By our Securities Act, the secretary of state, who happens to be Frederick E. Schortemeier, one of our state's most outstanding men, is commissioned with power to appoint a securities commissioner, deputies, clerks, etc., to administer the act.

During the year 1927 the commission collected in fees the sum of \$40,916.69 and spent in salaries and expenses in administering the law the sum of \$21,-339.50, leaving \$19,577.19 to revert to the general fund of the state.

WORK of the CHIEF MINING ENGINEER U. S. BUREAU of MINES

By GEO. S. RICE *

HE office of the Chief Mining Engineer acts as advisor within the Bureau of Mines on technical mining matters, especially those which affect both safety and economics. It represents the bureau in several technical committees of mining institutes, and the following come under its supervision:

MINE SAFETY BOARD

The Mine Safety Board of the Bureau of Mines is made up of representatives of two branches and several divisions thereof, with the Chief Mining Engineer as chairman. It was established principally to consider ques-

tions of the bureau policy on technical matters, and its decisions, when approved by the director, represent the policy or collective opinion of the Bureau of Mines on the particular subject as regards safety. The decisions deal with disputed questions and are reached unanimously after prolonged considera-

tion of data gathered from various parts of the country. These decisions are then issued from time to time as recommendations of the Bureau of Mines to the mining public. The principal decisions so far issued have dealt with questions of explosives in coal mining, lighting in coal mines, classification of coal mines on the basis of methane content, and rock dusting of all coal mines except anthracite mines. So far the decisions have been principally directed to coal mining, but other decisions pending relate to safety in metal mining and quarrying. Mine disaster reports often involving collective opinion of several kinds of engineering-mining, chemical, explosives, mechanical, and electricalare passed upon by the board, as well as other safety matters when the director requires a collective opinion.



Coal-dust explosion issuing from main portal of Experimental Mine. The white patches in the clouds of smoke are flame

The Work Of The Chief Engineer Is An Important Part Of The Bureau Of Mines' Activities—Principal Duty Is Advisor Within Bureau On Technical Matters With Particular Reference To Safety And Economics

EXPERIMENTAL MINE

The experimental mine near Bruceton, Pa., comes under the direction of the Chief Mining Engineer. The mine is unique. There is no other in the world in which explosion experiments can be conducted. In this mine, which was immediately developed in an outcrop of the Pittsburgh coal bed by the bureau when it was established in 1910, a thousand tests of coal dust and gas explosions have been carried on, some of which, when so planned, have been as violent at local points as ever experienced in any of the great explosion disasters. All the proposed methods of prevention of coal-dust explosions have been tried out in the experimental mine, culminating in the final decision that rock dusting is by far the surest of known methods. Since that time the testing has been conducted with a view to determining more closely the relative explosibility of coal dusts from mines of different parts of the country, in order to determine for the respective mine the explosion hazard which must be guarded against by its operator. The gas and coal-dust explosion effects and limits, which have been obtained in the testing at the experimental mine, have been practically adopted as international standards in research work of this nature.

At the experimental mine experiments have been conducted in sound ranging, testing for the further development of the geophone, tests of helium storage under high pressure, strength of ventilation stoppings, humidity and temperature tests, various kinds of mine ventilation tests

to determine coefficients of friction, studies of effects of auxiliary fans and tubing, and extensive testing for the great Holland vehicular tunnels in New York. The design of this \$50,000,000 project last named was not finally decided upon until tests were made in a facsimile tunnel in the experimental mine determine the amount of gaseous

contamination by motor cars which were run around and around in an elliptical trackway, to decide upon the limitations of carbon monoxide which it would be safe for persons to breathe who were traversing the tunnel, to study the movement of the air under the unique and first time tried method of transverse ventilation. It was not until the results of this extensive piece of testing work involving chemical and physiological control and engineering design for ventilation had been completed that the construction of the tunnels was begun. Mining men may well give attention to a project in which the total capacity of the ventilation fans is over three and onehalf million cubic feet per minute.

BRITISH COOPERATION

An official cooperation for research to increase safety in mining has now been carried on for over three years, between the British Mines Department and the Bureau of Mines. Its supervision on this side comes under the office of the Chief Mining Engi- (Continued on page 189)

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^{*} Chief Mining Engineer, United States Bureau of Mines.

Presented at the 30th Annual Convention of The American Mining Congress.

ACCIDENT PREVENTION in the BUTTE MINES of the ANACONDA COPPER MINING COMPANY

By John L. Boardman *

HE Anaconda Copper Mining Company has maintained an active organized effort to prevent accidents for the past 13 years.

The general policy upon which this effort is based is that accident prevention can best be accomplished by the mine operating staff. Accident prevention thus becomes an essential part of the regular work of the superintendents, foremen, and bosses.

The Anaconda Company safety organization consists of a General Safety Committee composed of the president, vice presidents, managers, and general superintendents of the various departments, the chief engineer and the ventilation engineer.

Each department has its own departmental safety committee in charge of the

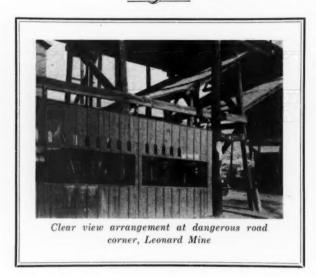
general superintendent and composed of the various superintendents and foremen.

The Bureau of Safety is a service department charged with the duty of studying accident causes and reporting them to the Safety Committees; making recommendations to these committees and to individual superintendents and foremen regarding accident prevention; carrying on accident-prevention propaganda and looking after the care of the injured; also, in the mining department, the Bureau of Safety takes care of the training in the use of breathing apparatus and looks after the breathing apparatus equipment.

As a result of the study of accident causes, a standard practice in safeguarding was adopted. Space will not permit the enumeration of all, but some of these standards are:

All working places in the mines must be trimmed down or timbered before any other work is done in them.

All floors must be of 3-in, lagging and laid secure and tight, to prevent men falling through them and to prevent loose



As The Result Of 13 Years Of Effort This Company Has Adopted A Standard Practice In Safeguarding, Which Has Resulted In A Most Satisfactory Record In Accident Prevention—They Maintain A Safety Organization, With Departmental Safety Committees, And A Bureau Of Safety—Eleven Standard Rules To Prevent Accidents

rock from falling on men working below.

All chutes must be provided with 10in. by 10-in. grizzlies, not more than 10 in. apart and wedged tight, and in no case shall grizzlies be more than one floor below the shoveler.

All manways, chutes, gobs and other openings where men might fall must be provided with guard rails.

All rill stopes must be provided with a safety chain or rope.

All trolley wires must be provided with approved guards.

All motors must be provided with proper headlights and bells.

All shaft stations must be equipped with doors or gates to prevent rocks falling down the shaft from striking persons on the stations; all cages must be equipped with safety doors and same kept closed while anyone is riding on the cage.

All hoisting equipment must be regularly inspected and put in safe condition before hoisting or lowering of men.

All power-driven machinery shall be provided with approved guards.

All raises must be offset one set when starting.

The company employs a safety engineer at each operating mine, who reports both to the mine foremen and superintendents and to the Bureau of Safety. These men spend their entire time inspecting the mines, making accident reports, looking after the prevention of accidents, and in looking after the mine ventilation.

The inspection reports included violations of safety rules or safe practice. These reports are made daily to the mine foreman and discussed with shift bosses each day at lunch time. Every two weeks a report of inspection is made to the chairman of the Bureau of Safety, independently of the mine foreman and superintendents. This report is checked up by the Bureau of Safety and passed on to the general manager and general superintendent.

copies being sent to the vice presidents. The two weeks' inspection report is then discussed, together with accident reports and other safety matters, at the foremen's meeting which is held every two weeks.

The object in giving mine foremen daily reports of inspection is to get immediate action in correcting adverse or unsafe conditions, and the two weeks reports furnished the Bureau of Safety, and by it referred back to the heads of the operating department, and discussed at the foremen's meetings, has a disciplinary effect upon the foremen, and helps to maintain their interest in accident prevention.

In addition to the copy of safety inspection reports which the Bureau of Safety send to the vice president, general manager, and general superintendent, a monthly comparison report of all accidents, classified by causes and estimated disability, is sent these officers, who compose the General Safety Committee. These men go over the inspection reports and comparative accident statistics individually and refer their comments to the

^{*} Chairman, Bureau of Safety, Anaconda Copper Mining Company, Butte, Mont.

foremen's meeting through the general superintendent.

At the operating mines about 400 men, trained in the use of oxygen breathing apparatus, are employed, and these men are given regular practice in the use of the apparatus so that they are ready at all times to respond to a call to duty in fighting fires underground.

There are approximately 1,500 men who have had training in first aid to the injured. This training is required of all bosses and foremen. Annually a first-aid contest is held to determine the two best teams, and these two first-aid teams are sent to contest against the best from Anaconda and Great Falls smelters, for the honor of representing the company's Montana operations in the inter-

national contest under the auspices of the U. S. Bureau of Mines. This year the Anselmo mine team of the Anaconda Company in Butte won highest honors in first aid at the international contest at Pittsburgh, Pa.

While the Anaconda Company is interested in first-aid contests, the real purpose behind this interest is the actual value of first aid to injured employes. The practical aim in first-aid training is to have a sufficient number of trained first-aid men working throughout the mines and shops that it would be impossible for an injured man to be neglected. It is now a very rare occurrence for a seriously injured man to even reach the shaft without having everything possible in the way of first-aid service done for him.

The company maintains two completely equipped automobile ambulances, with



Anaconda Copper Mining Company's first-aid team, winners of first place in the International First-Aid Contest at Pittsburgh, in 1927

attendant on duty on each, at all hours. These ambulances are so located that they can reach any of the mines which they serve in a maximum of 10 minutes after a call is received. In fact, they nearly always arrive at the mine before the patient reaches the surface, so that there is rarely any delay in the journey from the scene of the accident to the hospital. The geographical layout of the Butte mines is the reason for maintaining two of these ambulances. One machine could doubtless do the necessary work, but owing to the fact that about one-half of the mines are on the top of the hill and the others at or near the base of the hill, some delay might occasionally be caused by an attempt to perform the entire service with only one ambulance.

The company maintains two rescue stations, which are equipped with selfcontained oxygen breathing apparatus, and with an attendant on duty at each station at all hours. In this way breathing apparatus can be served to any of the mines within a very few minutes after a fire call is received. A total of 65 sets of two-hour type Paul breathing apparatus is kept ready for service, and a supply of oxygen and regenerator material sufficient to withstand a siege of one month is kept on hand.

Not only has the Anaconda Company continued and increased its efforts in accident prevention, but it has supported and cooperated with the efforts of the U. S. Bureau of Mines, and carries a maximum membership in the National Safety Council.

The company uses the safety bulletin service of the National Safety Council to the full

extent of their membership allotment, and uses the safety bulletins of several other organizations, such as the National Fire Protective Association and various insurance companies, and from time to time makes accident-prevention posters of its own. Recently a daily home-made safety bulletin series, covering 240 consecutive operating days, was completed.

In addition to the safety bulletins used, the Bureau of Safety publishes a monthly magazine, The Anode, of 20 pages, including covers. Ten thousand copies of this magazine are distributed monthly, free, to employes of mines and smelters. The Anode is devoted exclusively to the safety, health, and welfare of the employes and the company. The entire cost is borne by the company, and no paid advertising is accepted. The Anode carries com- (Continued on page 189)



First, 1-in. wire mesh shaft doors on underground station prevent rocks from shaft from entering station and permit free passage of air. Second and third, tim-

ber dog hoisting timber and lagging. Fourth, drift in Butte Mine, showing guarded trolley wire and electric cable.

SAFETY WORK at the UNION COLLIERY COMPANY

By P. L. COWAN *

HE Union Colliery Company is concentrating upon educating the individual employe in safety work. Every possible available means has been adopted to bring about a clear understanding of the part each individual plays in

the general safety record of the company. Upon entering the mine yard, driving or walking, no one could fail to see the large sign, made of flat sheet steel, with blue background and white lettering, which says: Notice to Those Seeking Employment—Unless You Are Willing to Be Careful to Avoid Injury to Yourself and Fellow Worker, Do Not Ask for Employment Here. We Do Not Want Careless Employes.

This program is carried along further, through information placed on bulletin boards around the man shaft, and in front of the washhouse. Each day new posters, copies of National Safety News, and other material are placed on these bulletin boards. A letter from some official in the organization to the employes is posted each week.

Once each week at a meeting of the foremen letters that have been placed in a locked box, used by employes for suggestions along safety lines, are read. These suggestions and criticisms have proved extremely helpful and have gone a long way toward promoting safety.

Altogether the bulletin system has proved effective. We use the Elliott Service Company News Posters as a means of attracting the attention of the employes to the bulletin boards. We use these bulletin boards also to show, by a numerical system, the total accidents in each week, with comparisons of previous weeks.

Every possible precaution for the safety of those underground is taken. The entryways are placarded or marked by name or number, much in the manner of a well laid out city. All refuge places are white-washed and cleaned regularly. Every place in the mine is examined before each working shift, and a written, signed record of each place on each date is kept.

A man, designated as "safety-first" man, is underground at all times. It is his special duty to study conditions and make recommendations for the prevention of accidents. If any unusual conditions are found the examiners notify the mine manager who holds checks of

This Company Believes Implicitly In Education Along Safety Lines For The Individual Employe, And This Article Tells How They Conduct Their Safety-First Campaigns, And General Instruction

men working in each place, until they are cleared.

Closed lights are used exclusively by the men, and in addition each of the 30 assistant mine managers carry Koehler flame safety lamps. No one is allowed to carry a cigarette or match underground. Stretchers are placed underground at every important point.

NOTICE TO THOSE SEEKING EMPLOYMENT

UNLESS YOU ARE WILLING
TO BE CAREFUL TO AVOID
INJURY TO YOURSELF AND
FELLOW WORKER, DO NOT
ASK FOR EMPLOYMENT
HERE. WE DO NOT WANT
CARELESS EMPLOYES.

This sign prominently displayed in the colliery yard

Special attention is given to fire prevention and fighting. Extinguishers are placed in every conceivable place in the mine. Foamite fire engines and fire buckets are placed at hazardous points throughout the property. Also the Du-Quoin rescue station is at our disposal, and in an emergency its crew could be on the ground in 10 minutes.

We have a large number of certified helmet men, and have masks ready for immediate use. We also have a Burrell mine air analyzer to analyze the return air.

We have our own emergency room within 50 feet of the shaft, which has operating table, stretchers, splints, and every modern surgical equipment. In case of injury to any employe, no matter how small, it is clinically treated and cared for regularly. In case of major injury the phones are used and hospital attendants and ambulance on hand at shaft when man is brought up. The company employs a surgical doctor who devotes his entire time to the clinic

and men. He keeps a written record of each injury, going into detail as to how it happened and to what cause the accident is attributable. The injury is treated and the date of each dressing recorded. In case of failure of employe to show up

at the clinic for treatment, he is sought out at his home and treated until able to resume his regular duties. No expense is spared in caring for the men after injury, and an unlimited amount is spent in the prevention of injury to our employes.

OIL BOARD RECOMMENDS CREATION OF TWO RE-SERVES OF COAL

Creation of two reserves of coal to be drawn upon when the petroleum supply must be supplemented is recommended to President Coolidge by the Federal Oil Conservation Board in its second report.

"The possibility that coal will be the source first to be drawn upon for supplementing the petroleum supply leads this board to unite with the Naval Oil Reserve Commission in recommending the creation of two reserves of coal available for this special purpose," said the board.

"It has been estimated," says the board, "that the reserves of bituminous, sub-bituminous, and semi-bituminous coal in the United States, within 3,000 ft. of the surface, amount to nearly two and one-half trillion tons and would yield about 92,000,000,000 barrels of motor fuel. This is more than three hundred times the production of motor fuel for the year 1927.

"The proposed reserves to be recommended for executive withdrawal include some 4,000 acres of publicly owned coal deposits in Wyoming and Montana, with an estimated content of 250,000,000 tons of sub-bituminous coal from which 80,000,000 barrels of oil could be produced. These reserves are selected because the tracts are close to railway lines so that track extensions would involve no delay, and the coal is near the surface so that it can be mined by stripping operators and expeditiously brought into production, with an output per miner tenfold that of underground workings. The extremely low operating costs and the facility with which these reserves could be developed are definitely known from commercial practice in the same areas."

^{*} Union Colliery Company, Dowell, Ill.





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The hills of Arlington from Potomac Park

—the line of light that plays

Along the smooth wave toward the burning west.

The ALASKAN BRANCH of the GEOLOGICAL SURVEY

By PHILIP S. SMITH *

BY the terms of its appropriation, the Alaskan Branch of the Geological Survey is charged with the duty of investigating the mineral resources of our great northwestern possession. This object has constantly been the guiding aim of its geologists and engi-

neers during the 30 years that this work has been in progress. In many ways the opportunity as well as the duty of the Government in fostering and assisting the mining industry in Alaska is unique. The greatness of this opportunity was thoroughly appreciated by Alfred' H. Brooks, the real organizer of this work, and it was his broad grasp of the problems that has enabled the survey to foresee many of the needs of the mining industry of the territory and his leadership that made it possible to meet some of those needs with the resources available.

The duties and organization of the Alaskan Branch differ from the duties and organization of other branches of the Geological Survey in that various activities performed by different branches in the states are all assigned to the Alaskan Branch. Thus all pertinent phases of geology, topography, and when money is available stream measurements are performed by the geologists and engineers of the Alaskan Branch, who, however, receive the helpful advice and assistance of their associates in the other branches and utilize fully the facilities afforded by these other survey units. This cooperation yields stimulating exchange of ideas and information and avoids waste through duplication of laboratories and equipment or the employment of additional high-class chemists, physicists, and paleontologists, whose services would be needed only for part of the time and only at irregular intervals. In other words, the Alaskan Branch is essentially a miniature self-contained survey, and at the same time is an integral part of the larger organization, profiting by the independence thus granted and yet benefitting by the cordial and close ties that knit it to its associates.

The help that the survey gives to the mining industry of Alaska is in a broad way the same as that which it gives in the states. Thus its members study and report on the different mining camps, interpreting the geologic conditions found and suggesting the places where condi-

Chief Duty Of This Division Of The Geological Survey Is Investigating Mineral Resources—More Than Forty Percent Of Territory Has Been Mapped And Every Known Productive Mining Camp Has Been Examined And Reported Upon

tions appear promising or unpromising for further search for mineral deposits. Some of this work is done in considerable detail, but most of it is done much less minutely than in most of the mining camps in the states. This policy has been adopted because in Alaska there is so much to be done, the time is so short, and the funds available are so meager that it has seemed of most value to make first the rapid reconnaissance or exploration of broad tracts. In other words, the work of the survey in Alaska may be distinguished from the related work in the states by describing it as more characteristically pioneering. Thus in Alaska far more than in the states does the work of the federal geologist or engineer go on contemporaneously with or even in advance of the work of the prospector. The trails hewed by the survey parties through the wildernesses of Alaska are often the routes later taken by the prospectors and miners who have followed the information contained in the Government reports. Among the earliest comers in many camps are found the Government geologists, who, unmoved by the mad frenzy of others in acquiring quickly won riches, pursue their duties of assembling and analyzing the facts regarding the new camp so that the public may have early and authoritative information.

Although admitting that much of this work is crude, if judged by the standards now applied by the Geological Survey to such monographic studies as it makes in its detailed investigation of mining camps in the states, I nevertheless believe that the work accomplished is worth while and fundamentally sound, whether it is measured by its "scientific" or by its "practical" results. In arriving at this estimate of the value of the work I have not allowed the adverse physical conditions under which much of it is done to weigh heavily, though I am well aware that they might be regarded justifiably as almost insuperable. Many of the observations are made and recorded in mosquito-smudged or sleet-covered notebooks, while pulling mired horses out of swamps, or dragging loaded canoes upstream through swift riffles in water perhaps waist deep, or driving tired dogs across wintry wastes with the wind whistling viciously as they struggle toward "Home"—a mere canvas tent snuggled in a clump of alders or in willows so small that they seem inadequate to supply

they seem inadequate to supply even the meager fuel required for preparing a meal. Instead, I have based my judgment almost solely on consideration of the complexity of the problems involved, the area covered in a given time, and the amount of money spent. When measured by these criteria, I believe that the work done in Alaska by the Geological Survey is not surpassed by that done by any other organization in any other part of the world and that not only it needs no apology but may well serve as an outstanding example of efficient and effective exploratory and reconnaissance surveys, just as the Fortieth Parallel, Hayden's and some of the other old surveys of the West and Canada stood as representatives for that kind of work in their day.

Such statements are, of course, likely to be regarded as matters of personal opinion, because the proof of the quality of a piece of scientific work can not be measured by any common yardstick, and the only real test of its adequacy is the way in which it stands up to the searching analysis of later workers and its application to new problems. The following, however, are some of the specific results accomplished:

- Every known productive mining camp in the territory has been examined and reported on by survey geologists or engineers.
- (2) More than 40 percent of the territory has been mapped, both geologically and topographically, on a scale at least up to exploratory or reconnaissance standards. The specific areas covered by the different kinds of surveys up to the end of the 1926 field season and without duplication of areas originally surveyed on one scale and later resurveyed in more detail are: Geologic surveys-exploratory, 75,150 square miles; reconnaissance, 161,755 square miles; detail, approximately 4,000 square miles; a total of all kinds of geologic surveys of approximately 240,900 square miles. graphic surveys — exploratory, 55,630 square miles; reconnaissance, 197,400 square miles; detailed, 4,066 square miles; a total area for all kinds of topographic surveys of 257,096 square miles.

^{*}Assistant Director, U. S. Geological Survey. Presented to the 30th Annual Convention of The American Mining Congress.

- (3) Approximately \$2,300,000 has been spent during the past 30 years on all phases of the survey's Alaskan work except for its publications. If, however, all other work is disregarded and only the maps enumerated above are charged against this total expenditure, their cost averages less than \$4.60 a square mile, or if only those geologic and topographic maps which are of reconnaissance standards are thus counted, their cost averages about \$6.40 a square mile, which is equivalent to 1 cent an acre.
- (4) More than 425 reports—nearly 15 a year-most of which are accompanied by both topographic and geologic maps as well as other illustrative material, have been printed. These reports are written principally about mining enterprises and with the aim of meeting the needs of those engaged in mining, whether they are the skilled engineers in charge of large mining operations or the untutored prospectors who are searching the hills with their simple equipment. These reports include not only special information regarding the distribution, character, amount and value of the various mineral resources but also give general information pertinent to mining development, such as facts relating to routes of access, means and availability of transportation, general labor conditions, availability of power, quantity of water for mining and milling, climate as it affects working season, availability of timber for general construction, and in mining.
- (5) A yearly record of the production of all the mineral commodities of Alaska is made and the results are published to serve not only as a history of the industry but also as a guide to current trends and a forecast of future development. A preliminary estimate for the current year is issued by December 31, and this is supplemented by a final report which is usually sent to press before the middle of the following year.
- (6) Hundreds of letters are answered from inquirers who seek information on any and all subjects connected with Alaska. Most of these inquiries, of course, relate to matters that properly fall within the field of the survey's duties, but others relate to matters outside that field but the answer to which might be known to some of its members because of their long familiarity with the territory—its present small force having had an aggregate of nearly 100 field seasons in Alaska.

Although the foregoing account of the contributions already made by the Alaskan Branch to the mining industry is recorded with justifiable pride, it is perhaps even more the present and the future that really concerns us, who are engaged in Alaskan work. For that future we see more clearly than perhaps

anyone else the need of better and more comprehensive studies. There still remains 350,000 square miles of country that has not been surveyed. Doubtless a part of this area is such that it does not justify survey at this time, but at least 200,000 square miles still remain that hold enough promise of containing commercial mineral deposits to warrant surveying them and finding out the facts. Furthermore, it must be obvious to every engineer that the reconnaissance scale of survey-4 miles to the inch-which is the most detailed scale that has been adopted for more than 98 percent of the work already done, is not adequate for the proper solution of the more difficult technical problems, so that if the demands of the mining industry are to be met. detailed work in selected places must be increased. Furthermore, as an outcome of the years of work already done, a mass of data bearing on many broad, significant problems have been accumulated. This material should be digested, coordinated, and worked up so as to be utilized. Desirable as are many of these projects, they can not be undertaken now because the funds available are so small as to prevent the diminished personnel now employed from giving attention to any but the most pressing immediate demands.

PROGRESS OF FEDERAL REV-ENUE SYSTEM STUDIES

(Continued from page 158)

visions as to deficiencies and assessments, surtax problems, or most of the other difficult and complicated provisions in the statute, the larger taxpayers are vitally interested in such matters. In other words, as a rule the complicated provisions are of interest to the 25 percent rather than the 75 percent, and it is largely because of the 25 percent that the law has become complicated for all taxpayers. I do not mean to suggest for a moment that the interests of these large taxpayers should be sacrificed to reduce complexity, for, though few in number, they contribute over 95 percent of the total tax. My thought is not to answer the problem, but to raise it for your consideration. may add that the rearrangement of the act proposed by the Joint Committee in its report is based primarily on the principle that there ought to be a plain and concise statement of income tax principles near the beginning of the act, chiefly for the benefit of the 75 percent group, but that the complicated provisions necessary chiefly for the important 25 percent group ought also to be retained and made as readily available as possible.

THE PRICE OF CERTAINTY

To say that the law should be made certain is only another way of saying that there should be specific provisions in each act, covering all of the situations and cases that will arise under that act in the future. Obviously, such an attainment is limited by the foresight of

the legislature. It is possible to foresee only a few of the cases that will arise under any revenue act, and hence some uncertainty will always exist.

Much the same problem presents itself when attempts are made to render the law more equitable and less harsh in its application to special cases and unusual situations.

SOME SUGGESTED IMPROVEMENTS

I now pass to problems somewhat more specific. There is a great deal of work ahead in the matter of revenue legislation. The Joint Committee has suggested a Code of Federal Tax Administration. If the plan is approved, much time and thought will be required in the compilation of the code. The Joint Committee has also suggested the advisability of going over the entire revenue act, word by word and section by section, in an effort to express more simply the substance of the law as it is today. Obviously, this task is of a most exacting nature.

In my estimation, however, the most important work ahead is the very broad problem of making a canvass of the act for the purpose of developing simpler basic policies throughout. The root of complication is in the very substance of the law. Our investigations have con-vinced us that unless the substance of the law itself can be simplified materially, it will be futile to expect adequate simplification. In other words, it is impossible to state complicated rules of law in such manner as to make them simple. For example, there is as a matter of substantive law, a complicated mutual interdependence between "basis" and taxable profit or deductible loss. The general rule that the basis is increased when taxable profit is recognized and decreased when a loss is deducted is well known. This general rule, however, is almost entirely obscured by the numerous substantive exceptions and qualifications. It is safe to say that there are few tax practitioners who understand fully the scope and operation of this part of the law as a whole. The reason why it appears complicated in sections 203, 204 and elsewhere is because the rules of law expressed in those sections are complicated rules of law. So, too, with other provisions, such as those relating to capital gains and losses, net losses, taxation of insurance companies, the treatment of trusts and estates, information and withholding at the source, the taxation of non-resident aliens and foreign corporations, and many other parts of the law. The statement of these rules is complicated because the rules themselves are complicated. Doubtless a degree of simplification is attainable, possibly more than I may be taken as having suggested by these observations. Simplification of the substance of the law, which can come only through long and careful study, is, in my opinion, an essential prerequisite to further improvement of the act.

These are some of the more important problems with which we all are faced today. Progress will be made only as we courageously face them and solve them. In this large undertaking there is ample work for all.



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LEGISLATIVE REVIEW

figure was set when the Senate Public Lands Committee was authorized to continue its investigations into the naval oil reserve leases and has been followed by Senate Committees in placing this limitation on the expenses of other proposed investigations. These include contemplated inquiries into administration of affairs of Indians

NVESTI-

GATIONS at

\$30,000 per

seem to be the order of the day

in the Senate.

There are so many demands for spe-

cial inquiries into

various subjects

that a limitation

of this amount is

being placed by

the Senate on all

investigations. The

and as to electric public utilities. The expenses of some investigations heretofore have reached such large figures that Senate leaders decided that future inquiries should be conducted at less expense and the flat sum of \$30,000 is being included in all resolutions which propose further investigations. Another investigation has been started, covering conditions growing out of the suspension of bituminous miners in Pennsylvania. Ohio and West Virginia. being conducted by the Senate Committee on Interstate Commerce. The penchant for investigations seems confined to the Senate as up to date during this Congress no special inquiry has been ordered by the House, although a number of its committees have been conducting hearings on various legislative proposals. The same is also true of several Senate committees, but these hearings do not assume the same aspects as special investigating committees.

Decision of the Senate Interstate Commerce Committee to recommend an investigation in the coal fields was reached

Coal Strike Inquiry Begun—Anthracite Mine Operation By Government Proposed—Senate Arrests Oil Man For Refusal To Testify On Matters Pending In Court—War Mineral Relief Bill Again Approved By Senate—Mexican Immigration Considered

after considerable agitation in both Senate and House, inspired by complaints from union leaders. Speeches urging an investigation were made in the Senate and House and union leaders appeared before the Senate Committee in favor of an inquiry. No objection was advanced by coal operators or railroads and the inquiry started with a visit by a subcommittee to the Pittsburgh district. The inquiry will cover charges that railroads participated in a campaign to destroy the union under which operators were compelled to insist on wages lower than those demanded by the union. The matter of injunctions by courts against miners is also expected to be looked into. Effort was made by some Senators to secure an inquiry as to the effect of railroad freight rates on the situation. A proposal that the Government acquire and operate anthracite mines and railroads was advanced in a bill introduced in the Senate by Senator Brookhart, Republican, Iowa, which he says is designed to prevent monopoly in the anEntrance Hall, Library of Congress

thracite industry. Other coal legislation considered has included a bill for the purchase of coal lands in Oklahoma from the Indians and to extend coal prospecting permits under the leasing law for two years in cases where holders of permits have been unable to conduct operations within

the time now fixed by law. Such extension has been voted by the Senate and the bill awaits action by the House.

For the third time in three successive Congresses, the Senate passed a bill for the benefit of claimants under the war mineral relief act. Heretofore this bill has amended the law so as to permit the

filing of claims for reimbursement on account of purchase of property and interest on borrowed capital. The bill this year has eliminated these features and is confined to allowing claimants to appeal their cases to the Court of Claims.

In order to keep down Government expenses and to permit a reasonable tax revision, administration leaders have passed the word around to Congressional Committees that no new legislative projects involving further expenditures shall be brought forward. This has resulted in a large number of bills laying idle in committees. These include a number of measures to establish additional mine rescue stations. During the month bills to establish three more stations in Kentucky were introduced. A bill was introduced to grant additional lands to the School of Mines in Alaska, and their sale for benefit of the school.

For the first time in many years the Senate ordered the arrest of an oil operator for refusal to testify before a Congressional Committee. This incident

arose in connection with the continuance of the investigation of the naval oil reserve leases by the Senate Public Lands Committee. Robert W. Stewart of the Standard Oil Company of Indiana, declined to answer questions by Senator Walsh, Democrat, Montana, on the ground that the information he sought was involved in pending cases in the courts. The Senate passed a resolution at the suggestion of Senator Walsh ordering the arrest of Mr. Stewart, but its carrying out was stopped by the District of Columbia Supreme Court which set aside the action of the Senate until after the case could be heard on its merits. Investigation of alleged violation of the anti-trust laws by oil companies in California and Arizona was requested in a resolution introduced by Ashurst, Democrat, Arizona. The claim is made that the companies are refusing to sell oil products to distributors who do not observe price quotations. The House passed a bill authorizing two-year extensions of oil and gas prospecting permits under the leasing law. As a means of checking over-production of oil, the Senate passed a bill authorizing the Interior Department to suspend leases for two years or reduce the acreage to be offered annually for oil and gas leases on the Osage Indian reservation in Oklahoma. Bills were introduced to compensate owners of land in the reservation for damages caused by oil and gas operations, including the pollution of streams.

Freight rate decisions by the Interstate Commerce Commission in their relation to the coal industry came up for discussion in the Senate when that body passed a resolution calling on the commission for a report by April 15 as to its authority to issue orders establishing rates restricting the markets of products of the various states. The claim was made in the debate that the commission could not exclude the products of one state from the markets of another state for the purpose of equalizing prosperity and industrial conditions. Reference was made to the action of the commission in reducing freight rates on coal from Pennsylvania to the Great Lakes, while at the same time refusing to lower rates on coal from Southern mines, it being claimed that the commission had created a monopoly for Pennsylvania bituminous in the markets of the Northwest.

The Senate Judiciary Committee held hearings on proposed legislation to restrict the right of courts to issue injunctions in labor disputes, during which consideration was given to injunctions issued in the coal strike.

Agitation for application of the quota law restriction to immigration from

Mexico has been renewed. The Senate Immigration Committee heard a representative of labor organizations in California in favor of such restriction. On February 16 the House Immigration Committee took up the question, hearing advocates of proposed restriction, followed on February 23 by those opposing restriction of the immigration. Another bill on the subject was introduced, by Senator Watson, Republican, Indiana, proposing a 10-percent quota limit to immigrants from Mexico.

The following is a summary of new bills and the status of measures which have received consideration in either the House or Senate:

WAR MINERALS

S. 1347. Mr. Oddie (Rep., Nev.). This bill provides for appeal to the Court of Claims by war mineral claimants. Passed by Senate.

H. R. 9680; H. R. 9681; and H. R. 10361. Mrs. Langley (Rep., Ky.). These bills provide for the establishment of mine rescue stations at Hazard, Jenkins and Pikeville, Ky. Mines and Mining.

H. R. 10157. Mr. Sutherland (Rep., Alaska). This bill grants 100,000 acres of vacant nonmineral surveyed unreserved public lands in Alaska for the support and maintenance of the Agricultural College and School of Mines in Alaska. The lands shall be sold for not less than \$5 per acre and the proceeds devoted to the purpose named. Public Lands.

H. R. 8126. This bill repeals a law permitting prospectors and miners to kill game or birds in Mt. McKinley National Park, Alaska. Passed by House.

S.J. Res. 84. Mr. Frazier (Rep., N. Dak.). This resolution provides for the filing with the Federal Trade Commission before March 31, 1928, by members of Congress and Government employes receiving \$3,000 salary or over, a statement showing the amount of investments they own in mining, oil and other corporations. Finance.

S. Res. 79. Mr. King (Dem., Utah). This resolution provides for an investigation of administration of Indian affairs at a cost of not more than \$30,000. Passed by Senate.

H. R. 10432. Mr. Sinnott (Rep., Oreg.); and S. 3006, Mr. McNary (Rep., Oreg.). These bills exempt the Klamath Indian Reservation in Oregon from the law requiring a fee collection by the Interior Department in connection with mineral and other leases. Indian Affairs.

H. R. 10358. Mr. Timberlake (Rep., Colo.). This bill provides for adjustment by the Court of Claims affecting mineral rights of the White River, Uintah, Uncompander and Southern

Ute Indians in Utah, Colorado and New Mexico. Indian Affairs.

H. R. 10085. Mr. French (Rep., Idaho). This bill provides for hearing by the Court of Claims of the claims of Nez Perce Indians in Idaho, including claims for gold mined by white men without authority and in trespass from the reservation of the Indians prior to the treaty with the Indians of June 9, 1863, and its approval April 17, 1867. Indian Affairs.

H. R. 9500. Mr. Williams (Rep., Ill.). This bill would prevent the shipment in interstate commerce of goods mined or manufactured by prison labor. Labor.

COAL REGULATION

S. 2826. Mr. Brookhart (Rep., Iowa). This bill is designed "to prevent monopoly" in anthracite, by providing for the acquisition and lease by the Government of anthracite coal lands and the construction or acquisition of railroads for transporting such coal. The act would be administered by a coal commission of three members appointed by the President. The coal mines and railroad facilities would be acquired by lease, purchase, condemnation, or by stock purchase. The commission could build new railroad lines from mines to assure competition with privately owned mines and to prevent discrimination in freight rates or service. The Government would operate these mines and railroads or lease them at a rate which would return it 4 percent annually on the cost of their acquisition, plus an amount to repay in 25 years the cost of their acquisition. Those operating leases from the Government would be required to mine an amount of coal as annually determined by the commission. The bill appropriates \$50,000,000. terstate Commerce.

H. Res. 109. Mr. Casey (Dem., Pa.). This resolution proposes an investigation into the strike conditions in Pennsylvania, West Virginia and Ohio, similar to a resolution previously introduced by Senator Johnson (Rep., Calif.). Rules.

H. R. 9858. Mr. Cartwright (Dem., Okla.). This bill provides for the purchase by the Government of the segregated coal and asphalt deposits of the Choctaw and Chickasaw Indians in Oklahoma. It appropriates \$12,010,000. Indian Affairs.

S. 1455. This bill provides for an extension for two years of coal prospecting permits under the leasing law. Passed by Senate.

S. J. Res. 38. This resolution authorizes New Mexico to lease minerals on lands granted it by Congress June 20, 1910. Enacted into law.

OIL MEASURES

S. Res. 132. Mr. Walsh (Dem., Mont.). This resolution called for the arrest of Robert W. Stewart, of the Standard Oil Company of Indiana, for refusal to answer certain questions before the Senate Public Lands Committee in connection with the naval oil reserve lease investigation. Mr. Stewart claimed he should not answer as the questions involved matters pending in court litigation over similar questions. The resolution was passed by the Senate, and Mr. Stewart was arrested, but released on a writ of habeas corpus by the District of Columbia Supreme Court, which is considering the jurisdiction of the committee to require the answers.

H.R. 479. Mr. Winter (Rep., Wyo.). This bill authorizes the Interior Department to grant oil and gas prospecting permits and leases on 1,600 acres of land in Wyoming to the Oregon Basin Oil and Gas Company. Reported by Public Lands Committee.

S. Res. 141. Mr. Ashurst (Dem., Ariz.). This bill provides for an investigation by the Senate Committee on Interstate Commerce of an alleged violation of law by oil companies operating refineries in California and distributing stations in Arizona. It is alleged that they have entered into an illegal combination to control the price of gasoline and oil by independent retailers upon refusal of retailers to maintain prices fixed by the combination, and to prevent independent dealers from securing gasoline and oil from other sources. Interstate Commerce.

H. R. 9348. Mr. Howard (Dem., Okla.). This bill provides that hereafter none but heirs of Indian blood shall inherit any right to any mineral interests of the Quapaw Indians, but not to apply to wives under existing marriages. Indian Affairs

H. R. 5783. This bill provides for twoyear extensions of oil and gas prospecting permits under the leasing law. Passed by House.

H. R. 8831. Mr. Leavitt (Rep., Mont.). The bill authorizes the Interior Department to collect a fee of 3 percent from royalties on production of minerals from leased Indian lands to be used for supervision of the leases. Reported by Indian Committee.

PRODUCTION RESTRICTED

S. 2360. Mr. Frazier (Rep., N. Dak.). This bill authorizes the Interior Department, in case of overproduction or inadequate prices for oil, to suspend leases for two years or reduce the acreage to be offered annually for oil and gas leases on the Osage Indian reservation in Oklahoma. It is provided, however,

IMPORTANT BILLS REVIEWED IN THIS ISSUE

Mining

S. 1347—War Mineral Relief. Passed by Senate. Oddie (R., Nev.). H. R. 9689—Mine Rescue Station. Langley (R., Ky.). H. R. 10157—School of Mines Land Grant. Sutherland (R., Alaska.). S. Res. 79—Indian Inquiry. Passed by Senate. King (D., Utah.).

Coal

S. 2826—Government Control of Anthracite. Brookhart (R., Iowa).
H. Res. 109—Strike Inquiry. Casey (D., Pa.).
H. R. 9858—Indian Coal Purchase. Cartwright (D., Okla.).
S. 1455—1wo Year Extension of Coal Permits. Passed by Senate.
i. J. Res. 38—New Mexico Mineral Leases. Enacted into law.

Oil

S. Res. 132—Arrest of Oil Man. Passed by Senate. Walsh (D., Mont.).
S. Rea. 141—Anti-Trust Inquiry. Ashurst (D., Ariz.).
H. K. 5783—Prospecting Permit Extension. Passed by House.
S. 2380—ndian Lease Suspension. Passed by Squate, Frazier (R.,
N. Dak.).
S. 1959—Reserve Lease Supervision. Passed by House.
H. R. 9294—Damage by Indian Oil Operations. Howard (D., Okla.).

Transportation

H. R. 9678— Steel Cars. Kolly (R., Pa.). S. Con. Res. 10—Rate Decisions. Passed by Senate. Robinson (D., Ark.).

Tariff

H. J. Res. 173-Tariff Exemption. Evans (D., Mont.). H. J. Res. 199-I ariff Reduction. Romiue (D., Mo.).

Investigations

S. Res. 83—Electric Utilities, Passed by Senate, Walsh (D., Mont.), H. Res. 96—Fertilizer Combination, Adversely Reported by Committee, Larsen (D., Ga.).

Injunctions

H. R. 10082— Restrained in Labor Disputes. La Guardia (D., N. Y.). H. R. 10759— Against State Laws. Black (D., N. Y.).

Immigration

S. 3019- Jen Percent Quota Against Mexico. Watson (R., Ind.).

that the unleased area shall be offered for lease not later than April 8, 1936. Passed by Senate.

S.1959. This bill transfers jurisdiction over leases on naval petroleum reserves from the Interior to the Navy Department. Passed by House.

H. R. 9294, Mr. Howard (Dem., Okla.); and S. 2727, Mr. Thomas (Dem., Okla.). These bills provide for the payment of compensation in connection with damages to crops or improvements or pollution of streams by operation of oil and gas leases on the Osage Indian reservation in Oklahoma. The damages would be fixed under rules of the Interior Department, with the right of appeal to the courts. Indian Affairs.

H. R. 10140. Mr. Bloom (Dem., N. Y.). This bill proposes an international exhibition of mine and other products at Brooklyn in 1932, in celebration of the two hundredth anniversary of the birth of George Washington. It also provides for the special coinage of 200,000 gold \$2.50-pieces and 1,000,000 50-cent silver pieces. Foreign Affairs.

S. J. Res. 62. This resolution provides that Government departments shall make exhibits at the Facific Southwest Exposition in California. Passed by Senate.

S. Con. Res. 8. Mr. Shipstead (F. L., Minn.). This resolution forbids Government departments from committing the Government to the supervision of the fulfillment of financial arrangements between American and foreign governments or for military intervention by the Government to compel observance of obligations between Americans and foreign countries. Foreign Relations.

H. R. 9678. Mr. Kelly (Rep., Pa.). This bill provides for the use of steel cars in the railway postal service after January 1, 1930. Post Offices.

FREIGHT RATES

S. Con. Res. 10. Mr. Robinson (Dem., Ark.). This resolution requests the Interstate Commerce Commission to report by April 15, 1928, decisions rendered in the five years before April 1. 1928, which were influenced by the competitive advantage or disadvantage of producers in one state, district, or section, as compared with other districts. The commission is also to report as to what power it has to equalize prosperity among the producers of commodities. The resolution points out that State Legislatures and others have claimed that the commission has attempted to regulate rates so as to equalize prosperity among producers and, by rates, has placed an embargo upon products of certain states to favor the products of other states as to certain markets. Passed by Senate.

H.R. 9835. Mr. Kopp (Rep., Iowa). This bill provides that railroads shall not charge more for a short haul than for a long haul. Interstate Commerce.

H. R. 10376. Mr. Newton (Rep., Minn.). This bill amends the transportation act regarding determination of income by railroads. Interstate Commerce.

H. R. 9948. Mr. Chalmers (Rep., Ohio). This bill provides for a 25-ft. channel for the Great Lakes and connecting waters. Rivers and Harbors.

H. J. Res. 191. Mr. Hogg (Rep., Ind.). This resolution proposes a constitutional amendment to tax securities issued by Federal and state governments. Ways and Means.

H.R.1. Amendment to by Mr. Jones (Rep., Wash.). This amendment to the tax revision bill provides for development of the merchant marine as provided in a bill passed by the Senate. Finance.

TARIFF REDUCTION

H. J. Res. 173. Mr. Evans (Dem., Mont.). This resolution exempts from tariff duty articles imported from foreign countries which are exchanged for American farm products for exportation. Ways and Means.

H. J. Res. 190. Mr. Romjue (Dem., Mo.). This resolution provides for reduction under the flexible provision of tariff duties under the metal schedule as a means of relieving the agricultural situation. Ways and Means.

H. Res. 102. Mr. Sinclair (Rep., N. Dak.). This resolution calls on the Ways and Means Committee to report proposed tariff revision by June 1, 1928. Rules.

H. Con. Res. 19. Mr. Wood (Rep., Ind.). This resolution provides that American-made materials shall be given preference in Government purchases. Interstate Commerce.

S. Res. 83. Mr. Walsh (Dem., Mont.). This resolution provides for an investigation of electric public utilities doing an interstate business by the Federal Trade Commission. Passed by Senate.

H. Res. 96 and 97. Mr. Larsen (Dem., Ga.). These resolutions provide for a report by the Department of Justice and an investigation by the Federal Trade Commission as to alleged combinations in violation of the antitrust law in the fertilizer industry. It is alleged that the companies have advanced prices and that the prices are so even as between different companies as to suggest a common understanding and combination.

Judiciary. The committee has adversely reported H. Res. 96.

H. R. 7937. This bill provides for assistance by the Geological Survey to the War Department in surveying and preparing military maps. Passed by House.

H. R. 7201. This bill provides for settlement of claims growing out of the holding of enemy alien property by the Alien Property Custodian. Passed by House and reported by Senate Finance Committee.

H. Res. 93. Mr. Schafer (Rep., Wis.). This resolution calls for an investigation by a House Committee of the administration of affairs of the Alien Property Custodian, including sale of patents to the Chemical Foundation and the release of property to the American Metal Company. Rules.

COURT INJUNCTIONS

H. R. 10082. Mr. LaGuardia (Rep., N. Y.). This bill would prohibit courts from issuing injunctions in labor disputes. Judiciary.

H. R. 10759. Mr. Black (Dem., N. Y.). This bill would forbid courts from issuing injunctions against the law of a state or a contract between a municipality and a public utility. Judiciary.

S. 2783. Mr. Dill (Dem., Wash.). This bill would forfeit patent rights in case of conviction of a patent holder under laws prohibiting monopoly. Patents.

H. R. 9845. Mr. Berger (Soc., Wis.). This bill provides for Government ownership and operation of telegraph and telephone lines in interstate commerce. Interstate Commerce.

H. R. 9949. Mr. Blanton (Dem., Tex.). This bill proposes to repeal the bank-ruptcy law on the ground that the public has to pay for losses under the law. Judiciary.

MUSCLE SHOALS

S. 2786. Mr. Willis (Rep., Ohio). This bill proposes to lease the Muscle Shoals, Ala., nitrate and power project to the American Cyanamid Company and Air Nitrates Corporation. Agriculture.

S. J. Res. 46. Mr. Norris (Rep., Nebr.). This resolution provides for Government operation of the Muscle Shoals project. Reported by Agricultural Committee. The Senator proposed amendments to the resolution for 25-year contracts for the sale of electricity from the project to states, cities or non-profit cooperative organizations which provide transmission lines to the project, and for lease of the nitrate project to the American Cyanamid Company. Agriculture.

H. R. 10028. Mr. Morin (Rep., Pa.). This bill provides for a 25-year lease of the Muscle Shoals project and for experiments in nitrate production by the Department of Agriculture at Muscle Shoals or elsewhere. Military Affairs,

IMMIGRATION

S. 3019. Mr. Watson (Rep., Ind.). This bill proposes to apply a 10-percent quota limitation on immigration from Mexico, and to continue the present 2-percent quota against immigrants from other countries. Immigration.

S. 2920. Mr. Walsh (Dem., Mass.). This bill proposes to repeal the national origin provisions of the immigration law. Immigration.

H. R. 9828. Mr. Brand (Dem., Ga.). This bill provides for the recording by the Department of Labor of certain information as to immigrants arriving in the United States. Immigration.

H. R. 10167. Mr. Porter (Rep., Pa.). This bill authorizes participation by the Government in an international immigration conference at Havana, March 31, 1928, and appropriating \$5,000 for expenses of the American delegates.

H. R. 10803, Mr. Somers (Dem., N. J.); and S. 3011, Mr. Reed (Rep., Pa.). These bills prohibit the manufacture, sale or transportation of adulterated, mislabeled, or misbranded linseed oil, turpentine, or paint. Manufactures.

H. R. 9837. Mr. Andresen (Rep., Minn.). This bill appropriates \$1,200,000 to carry out an award of the National War Labor Board in 1919 which allowed increased wages to employes of the Minneapolis Steel and Machinery Company and other companies. Claims.

S. 2741. Mr. Edge (Rep., N. J.). This bill authorizes the Navy Department to investigate a claim of the Tioga Steel and Iron Company under war contracts. Claims.

AMERICAN WELDING SOCIETY TO MEET

The American Welding Society is to hold its annual meeting in New York April 25, 26 and 27. The technical sessions will include discussions of progress made in welding, procedure standardization in welding of structural steel, pressure vessels, and pipe welding. Plans will be laid at the meeting for future investigational activities, and officers will be elected.

The program will include a luncheon at the Engineers' Club and the annual dinner. Further information may be obtained from the society at 33 West Thirty-ninth Street, New York City.



The WORK of SAFETY DIVISION U. S. BUREAU of MINES

Bu D. HARRINGTON*

functions is assisting at time of mine disasters such as explosions, fires, or cave-ins. The money allotment for the Safety Division for the fiscal year 1927-1928 is \$343,210; the personnel numbers 83, and of these 15 are engineers; there are 10 safety division districts in the United States, and these districts

are served by 10 mine-rescue cars and 10 mine-rescue stations. Equipment and supplies on the cars and at the stations include mine-rescue apparatus, oxygen, regenerators, gas masks, anemometers, psychrometers, various types of safety lamps, resuscitators, gas dedectors, etc.

HE work of

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Since its establishment, the Bureau of Mines has trained in first-aid and minerescue more than 200,000 workers in the mining, oil and steel industries, in addition to having instructed hundreds of others outside the industry but usually in or near mining localities. The number now being trained annually is approximately 40,000. During the last fiscal year ended June 30, 1927, first-aid training was given to 37,917 and minerescue training to 2,961 men in 581 mining, metallurgical, quarrying or oil communities in 40 States and Alaska.

Since The Establishment Of This Division The Bureau Of Mines Has Trained In First-Aid And Mine-Rescue Work More Than 200,000 Workers—Trains Approximately 40,000 Men Annually—The Work Of This Division Carefully Outlined

A special course in directing rescue or recovery work was given chiefly to mine officials. It is somewhat difficult for mine officials to be away from their duties for the two-week period required for the advanced course, but 457 mine officials completed it last year in Arizona, California, Idaho, Utah, Montana, Colorado, New Mexico, Illinois, Kentucky, and Pennsylvania, and it is confidently expected that at least 1,000 will complete the course this year.

The Safety Division spends much time and effort in connection with first-aid and mine-rescue meets, in training the mine employes either before the meets, or as judges during the meets, or as both. During the last fiscal year, the Bureau men actively assisted in 69 meets, at which 1,025 teams involving 6,150 persons participated as principals; these meets were distributed through mining, metallurgical, and oil communities in 21 states.

Rescue team from the U.S. Bureau of Mines entering the Kinlock mine following the explosion of February 20, 1928

An International First-Aid and Mine-Rescue Meet, sponsored by the Bureau, is held nearly every year in conjunction with the aid of organizations aligned more or less directly with mining. The last International Meet was held at Pittsburgh on August 30 and

31, and September 1, 1927, with 47 first-aid and 18 mine-rescue teams participating, involving about 300 men from 13 states, representing coal and metal mines as well as the oil industry.

The 15 engineers in the Safety Division, besides directing first-aid and mine-rescue training in their districts, conduct field investigations concerning safety in the mining industry. At the time of a mine explosion or other disaster, the engineers have charge of the car or station personnel and equipment, and at the request of mine officials aid in the recovery or other work and investigate and report on the cause of the disaster.

During the past fiscal year assistance was rendered and investigations made of 41 accidents or disasters involving 16 mine explosions, 20 mine fires, and 5 cave-ins or floods, the total involving 356 killed and 71 injured.

Coal mine explosions are investigated by bureau engineers to determine the cause, point of origin, means of propagation, and contributory conditions and factors tending to retard the progress of the explosion. In this work, the direction of explosive force and occurrence of coking are noted; samples of road, rib and roof dust, face coal, and mine air are collected. The results obtained in these studies and recommendations for pre- (Continued on page 193)

^{*}Chief Engineer, Safety Division, United States Bureau of Mines.

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PRACTICAL OPERATING MEN'S DEPARTMENT



METALS

GUY N. BJORGE Editor

Practical Operating Problems of the Metal Mining Industry



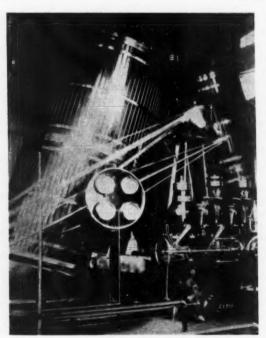
PUMPING at the PARK UTAH MINE

By C. C. CUSHWA *

HE Park Utah Mining Company was organized in 1917 to prospect a group of mining claims in the Blue Ledge mining district of Wasatch County, Utah. Geologically, these claims, and other ground near by, constitute an easterly extension of the famous Park City district. The Park Utah estate adjoins ground owned by the Ontario Silver Mining Company on the west, extending 3 miles to the east in a belt 2,500 to 4,500 ft. wide. Access to this ground was gained through the Ontario-Daly drain tunnel, a project completed in the nineties

for the purpose of draining mines in the Park City district. Park City mines have battled with large flows of water throughout their history, the working depths frequently having been determined by the elevation of the various drain tunnels. The Ontario-Daly drain tunnel is the lowest one so far considered practicable from an economic standpoint.

Shafts in Park City have their collars at elevations between 6,300 and 9,000 ft., with much of the vein outcrops lying above 8,000 ft. Heavy falls of snow blanket the district, and higher mountains to the south in winter furnish an unfailing water supply throughout the intensely fissured areas in which the ore is found. Most of the mines within the district were relieved of pumping large flows of water when the Ontario-Daly drain tunnel was connected to the Daly West shaft. The portal of this tunnel lies at an elevation of 6,300 ft., which drains all workings in the Daly-Judge, Daly-West, Daly, and some other shafts which bottomed at or above the elevation Problems Of Drainage In Park City District Serious—A Description Of How Park Utah Mine Solves Problem—Use Of Centrifugal Pumps Advocated —Use Of Booster Pumps Commended—Open Ditches Undesirable



Cylinder head of famous Cornish pump installed in 1881. Cost of pump, \$137,000; installation, \$750,000. This installation was considered one of the greatest made in the United States and created national comment

of the drain tunnel. The collar of the Ontario shaft lies at 7,800 ft.; the Ontario reaches a depth of 2,000 ft. (5,800 ft. above sea level), the bottom level being 500 ft. below the drain tunnel. Water encountered in the workings below the 1,500 (drain tunnel) was, of course, pumped to that height. The Ontario was pumping nearly 2,700 g. p. m. when the lower levels were closed down. The volume of water in the drain tunnel ditch varies from 13 second ft. (about 5,850 g. p. m.) to 28 second ft. (12,600 g. p. m.). The great extent of under-

ground workings in mines connected to the drain tunnel prevents superficial flows from reaching the deeper mine workings to any important degree. Seasonal variation in Park Utah flows has been too slight to be noticeable.

Park Utah ores occur only in the McHenry fissure system. The McHenry is a great fault fissure, striking almost due east-west, and dipping to the north at about 45 degrees. Total vertical displacement on the fissure was estimated by Mr. Boutwell at 2,500 ft., although, locally, various spurs tend to reduce that figure. Within the stoping area at the Park Utah mine the vertical displacement amounts to about 1,150 ft. This is approximately the thickness of the Weber quartzite, whose base on the footwall side and top on the hanging-wall side of the fault occur at the 900 level at the west end of the western ore body. The Wasatch limestone, which underlies the Weber quartzite, is therefore the foot-wall rock throughout the important producing areas. This is a hard, thick-bedded white limestone, commonly silicified or marmorized. It contains few

^{*}Superintendent Park Utah Consolidated Mines Co., Keetley, Utah.



The main centrifugal pumps are installed 18 ft. above the station level. Need of submersion or priming is totally eliminated by using booster pumps, installed in sump, which take water by gravity and feed it to the centrifugal pumps, thus precluding the possibility of drowning

New centrifugal pumps installed on the 1,800 level. These pumps, weighing only 3,000 lbs. each and costing but a fraction of the old Cornish system, have a capacity of 3,000 g. p. m. with one unit resting, or 7,000 gallons in all, as compared with the old pump capacity of 2,560 g. p. m.

strong fissures and is certainly not an important source of water. The Weber formation is a massive, thick-bedded quartzite, very strongly fissured near the ore bodies, furnishing, in broken zones, open water channels through which the water passes as freely as if it were in pipes. Except for a few small streams in the McHenry fissure, all the water pumped from the Park-Utah mine is derived from the quartzite.

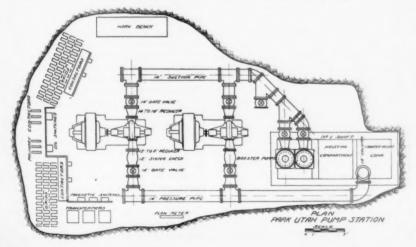
The mine workings are reached through the "South Crosscut" driven through the McHenry fissure from the Ontario-Daly drain tunnel at a point about one and three-fifths miles from the portal. The mine workings lie within the McHenry fissure, east and west of the South Crosscut. The first commercial ore body was found to the eastward. Approximately 250 gallons per minute was opened up when the ore was struck. This water advanced with the heading, draining the

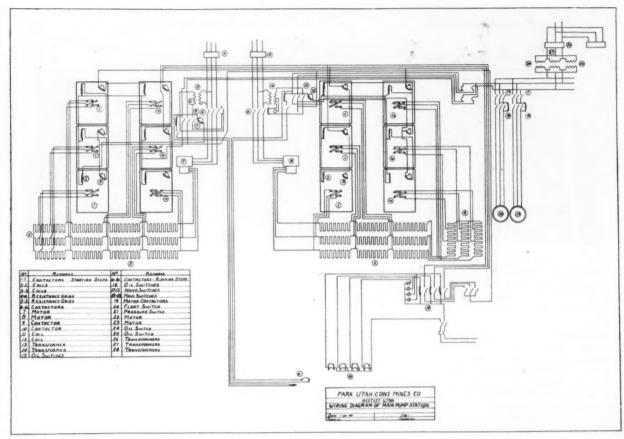
ore and walls almost completely 50 ft. back from the face. With sinking, the water increased so that 300 g. p. m. was pumped from the 1,600, 375 g. p. m. from the 1,700, and 450 g. p. m. from the 1,800. The flows were considerably larger for a few days after drifting was started on each of the above-named levels, but fell off shortly to about the quantities quoted. Pumping these flows was done by means of 400 to 600 gallon Cameron D. V. pumps, commonly with 100 percent reserve capacity available.

In 1923, ore was encountered west of the South Crosscut on the 1,500 or tunnel level. This ore body was developed rapidly, although no stoping was attempted until the International mill at Tooele, Utah, was ready to receive shipments. A large tonnage of complex silver-lead-zinc-gold ore was soon blocked out, and shipping started in November, 1924. Previously, drifting had been

started west on 1.800 from the eastern (No. 1 shaft) toward the projected position of the newer western strike. Two 1,000-gallon Allis-Chalmers single stage centrifugal pumps were installed in anticipation of a considerable increase in the flow of water. The west heading developed water very rapidly. Before we reached the western ore body the flow increased to about 1,500 g. p. m. On cutting the western ore the flow again increased so greatly that a third 1,000gallon pump became necessary. On December 1, 1925, crosscutting encountered a new stream which added over 1,000 gallons per minute to the already heavy flow. Work in the western 1,800 level headings was stopped while other pumps were being ordered and installed.

Two 600-gallon D. V. Cameron pumps, taken from abandoned stations, were set in tandem, and a 2,000-gallon D. V. Cameron tandem set was ordered and installed as quickly as possible. Pumping capacity was so urgently necessary that station design was neglected, particularly as economic operation was next to impossible with such an assortment of pumps. There were as great variations in heights of suction lifts as in sizes of pumps. To overcome the great loss of efficiency which is caused by excessive suction heads, a Byron-Jackson deep-well type pump, rated at 2,700 g. p. m. against a 40-ft. head, was connected into the suction of each pump. Each connection contained a valve, allowing any unit of the battery to operate on its own suction or to receive the discharge of the Byron-Jackson "booster." In this way the pumps were forced to deliver their rated capacity, which was sufficiently high to allow development work to proceed. A





new No. 2 shaft was raised to the 1.500 level on the east end of the western ore body. Immediately after the urgently necessary equipment was ordered plans were made to replace the greater part of the above-described equipment with a more efficient plant. Mr. O. N. Friendly, chief engineer of the Park Utah Company, and Mr. Leonard Wilson, consulting electrical engineer, cooperated in designing the new installation.

Various important factors were considered in the plans. The total flow of water amounted to about 3,150 g. p. m. Power shut downs were frequent enough and of long enough duration to demand consideration. The rock in which the pump room was to be cut is a hard, silicified limestone which is hard to drill and hard to break. Keeping the excavation to a minimum size was therefore important. The shaft at which the pump station was cut was then in use for hoisting a considerable tonnage of ore without which our production schedule could not be maintained. The extent of the ore bodies was not known, so that the advisability of a plunger pump installation was questionable. The paramount consideration was providing enough sump room to allow for power shut downs of as long as eight hours duration, without danger of drowning the pumps. Cutting The alternative was to set the pumps high enough to make available as sump room the 4,500 ft. of drifts and crosscuts then open on the 1,800 level. As the 1,800 station at No. 1 shaft is 12.0 ft. lower than the 1.800 station on No. 2 shaft (serving the western ore body), there was room for a five-hour accumulation of water at No. 1 before flooding the sump and pockets at No. 2; while another five-hour capacity in western excavations could be utilized as an emergency sump room by elevating the pumps 18.0 ft. higher than No. 1 station sills. This solution of the difficulty was used, and the pump-room excavation started.

The accompanying sketch of the pumping plant shows the details of the pipe layout, and the relative positions of pumps, motors, electrical control panels and switches. The two main pumping units are single-stage Cameron centrifugals, type H. V., rated capacity 2,750 g. p. m. against 300-ft. head. They are direct connected to 300 h.p., 2,300-volt, variable speed slip ring G. E. motors. Water is delivered under pressure to the suctions of the centrifugals by means of two booster pumps, whose intake sits 1.5 ft. below the 1,800 No. 1 station sills. These are Byron-Jackson deep-well-type pumps, rated at 2,750 g. p. m. under 30ft. head, directly connected to 40 h.p., such a sump was out of the question. 900 r. p. m. vertical Westinghouse motors,

operating on 440 volts. As shown on the sketch, the booster pumps discharge through 14-in, valves into the "suction pipe," which is connected, also through 14-in, gate valves, into the suctions of the two main pumping units; the pipe being reduced from 14-in. to 10-in. between the suction valve and the pump intake. On the pressure side of the centrifugals, the 8-in. discharge is increased by an 8-in, to 12-in, reducer after which 12-in. swing checks, 12-in. gate valves and 14-in, to 12-in, reducers connect the line into the 14-in, pressure pipe. Thence the pressure line is turned into the 14-in. columns, which hangs in the counterweight compartment of No. 1 shaft. The fifth valve shown in the suction pipe was placed to permit connecting the discharge from the booster on the old station into the intake of the main pumping units. Smaller auxiliary units are placed on the old station, whose sump is now used as a settling basin.

A diagram of the wiring arrangement of the new station accompanies this article. The motor for each main unit is controlled by a separate panel, although the operation of either or both main pumps may be controlled by float switch contactors. Starting is done by manual operation of the switches, the booster always being started and discharging through the bleeder before cutting in the centrifugal. There are three steps in the control switches, each cutting out its bank of resistance grids. This arrangement gives four speeds of revolution to the drive motors. The control switches are governed automatically, after starting the pumps, by float-switch contactors which are placed in the settling basin. Pilot lights placed on the pump station indicate to the operator the height of water in the settling basin, as well as the speed of revolution. Some characteristics of the pump operation are given in the following table:

in the main units, being then filtered for reuse in other motors. No impeller replacements have yet been necessary in the main units, other than the changes due to renewal of wearing parts. In order to facilitate such changes, two complete impeller assemblies are kept on the pump station. Booster pumps require oil, and coupling leathers are changed occasionally; no other repairs have yet been necessary. The boosters have done away with the annoyance and danger consequent upon "losing the water."

Position of	Efficiency correcte	d for motor	and transmission losses))	
control switch	consumed	H.P.	G.P.M.	R.P.M.	Gal./K.W.	Efficiency
All Out		217	1,955	1,565	12.1	64.35%
First Step		248 279	2,200 2,650	1,665 1,710	12.4 12.7	66.14% 70.6 %
Third Step		290	2,770	1,780	12.8	71.1 %

The above data was secured shortly after the pumps were placed in operation. Pump housings and impellers were new. Water flow was measured only by flow-meter readings. Later readings, checked by weir measurements, do not reach 70 percent efficiency.

Since the flow remains well above the maximum capacity of one main pumping unit, auxiliary pumps are used to lift the excess. One 350 g. p. m. centrifugal was used for several months, and one 1,000 g. p. m. pump is now ready to be placed. Having a number of good motors of various sizes on hand, experience shows that the cost of installing several sizes of auxiliary pumps is less than the power cost occasioned by throttling to reduce capacity of one large pump. When development headings are stopped the flow gradually decreases. During a recent period, while drifting on the west 1,800 level was stopped, the flow fell from 3,150 g. p. m. to 2,850 g. p. m. The next increase raised the quantity of water to 3,200 g. p. m. over night. As the development campaign calls for continued advance on the lower levels, it is only a reasonable precaution to be prepared to handle, economically, any flow which may be encountered.

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The main plant has operated very satisfactorily. Three shift operators take care of oiling, ordinary repairs and adjustments, start the pumps after power interruptions or needed shut downs, and make changes in operation of auxiliary pumps as needed. They also close a bulkhead door on the 1,800 level immediately after the pumps are stopped by power interruptions. Repairs involving the removal of pump housings are done by repair mechanics. Ordinary red engine oil is used in pump bearings at the rate of 11/2 to 2 gallons per month. "Dynol," a very light oil, is used in motor bearings. The 300 h.p. motors each require 5 gallons per filling; this oil is used 60 days

The efficiency of the large centrifugals is higher than was expected, although much lower than that of well-designed plunger pumps. All centrifugals fall off in efficiency and capacity as wear develops in the close running fits of impeller bronzes. The maximum efficiency of this plant, with new pumps, corrected for motor and transmission losses, was found to be 71.1 percent. Results from later measurements have fallen considerably below that figure. Initial efficiency is now approximately 68 percent, falling within a few weeks to 66 percent, after which it falls slowly to a minimum of 63 percent. Operation of centrifugals thus becomes a nice problem of balancing loss of efficiency against cost of repairs. The summary of operating costs of the Park Utah pumping plant is given in the following table:

plant is interesting. The discharge from the pumps is carried to the 1,500 level in a 14-in, column. At the 1,500 level this pipe is turned into a 16-in. wood stave pipe, which conducts the water 2,000 ft. to a box weir; the weir empties into the drain tunnel ditch. As the wood pipe parallels the track on which our ore trains pass, it was necessary to protect the pipe from wrecks and derailments of the ore cars. This was done by bolting 3-in. by 8-in. planks to the pipe. The planks lie on the upper side, toward the track, at about 45 degrees from the horizontal, being fastened by means of J-bolts, which are hooked under the round steel hoop-bands. This has saved the pipe from being damaged by several rather serious wrecks. Before the wood pipe was used, the water was carried partly in a wood flume and partly in an open ditch. Immediately after the wood pipe was connected, the flow of water dropped almost 200 g. p. m. In this connection, repeated measurements of the drain tunnel flow fail to disclose any measurable seepage into the lower levels from the tunnel ditch.

A few conclusions from our experience may be worth recording. While centrifugal pumps do not compare in efficiency with good plunger pumps, the lower cost of installation is a potent factor. So many unknown and variable circumstances enter into plans for important construction work, that each mine must work out its own methods, giving due consideration to its probable life and to the length of time a pump station may serve effectively. Open ditches are highly undesirable when seepage may be a source of water in lower workings. The cost of piping water in wooden pipes is

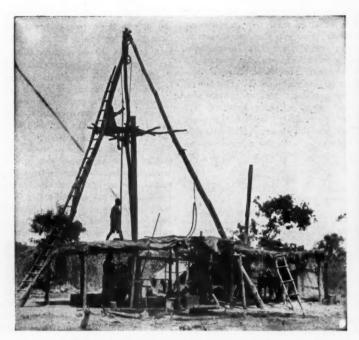
		PARK	UTAH PUMPING	COSTS, 1927	Cost per		A
Oil Labor		Power	Supplies	applies Total cost		Ft. of lift	G.P.M.
\$73.40	\$6,304.87	\$27,778.49	\$1,478.53	\$35,635.29	\$.1557	292	3,000

Large plunger pumps, which lift water at efficiencies between 82 and 88 percent. very soon repay the difference in cost of installation. On the basis of 85 percent efficiency from a plunger pump against 66 percent from centrifugals, the saving in power alone would amount to \$6,200 per year in the Park Utah plant. Cuts in labor and repair costs would increase this saving so that a plunger pump installation would pay for itself in two years. The assumption of 66 percent efficiency for this plant is an exaggeration, for it is impossible to adjust the auxiliary pumps so that the main unit constantly runs at its maximum speed. Beside losses due to resistance grids the pump efficiency drops as the speed is decreased.

One other feature of the Park Utah

much less than the cost of pumping large seepage flows, and, in underlying stopes, the difficulty resulting from seepage water is too serious to be allowable in any circumstances. The use of booster pumps is certainly commendable, because of the low cost of sump capacity; because of the freedom from worry of drowning the pumps, and because burning out centrifugal pumps, due to "losing the water," is completely avoided.

A Swedish civil engineer has discovered that excess sulphite lye and lumber refuse left by the manufacture of chemical pulp can be combined to form a fuel which is said to burn more easily than coal, give no smoke and leave no slag residue.





From tropic to glacier. Left, diamond drill outfit prospecting on the site of ancient copper workings between the headwaters of the Congo and the Nile. Right, in 1919 this diamond drill and gasoline engine were hauled over the snow 16 miles from Laidlaw, B. C., to the Lucky Four Mine property at 6,550 ft. altitude on a glacier, in the Cheam Mountains. The first location was in a pit in the snow 30 ft. deep where a 700-ft. hole was successfully bored

The ROMANCE of the DIAMOND DRILL

By S. B. KING *

MONG all the appliances used in the mining industry, there is perhaps none of more widespread human interest than the diamond drill. To the layman in mining matters, the drill and its work are ever mysterious; while even to the ordinary, practical miner, there is something uncanny about the method. To the experienced min-

ing engineer, the words "Diamond Drill" bring recollections of pioneering days, of life in the wilderness or on the frontier, perhaps in foreign lands, of the discovery of deposits of coal or of ore, which have since become famous mines.

A collection of diamond drill cores suggests pictures of romance, excitement—often hardship. Here are short, fat, coal cores from the New River District in West Virginia; from Illinois, and Indiana, many of them; from Colorado and New Mexico. Next, there is a core of solid rock salt from Louisiana; a smooth, thin core of limestone from Bisbee, Ariz., 3,200 ft. below the surface, cores of jasper and taconite from

From The Rocky Mountain Region And Our Own Great Coal, Oil And Iron Fields To The Congo And The Rand, The Diamond Drill Has Made A Log Of Mining Development And Has Played A Conspicuous Part In The Romance Of World Mining

Lake Superior, in which a foot a day was good drilling. Next, then a lump of native copper which the drilling located in opening a rich mining venture.

Here is an old diamond bit with the stones cut out, and tagged with the information that it was the last bit in a hole 6,340 ft. deep on the Rand in South Africa. These pencil-like cores were made with a "Flugged" bit in prospecting for lead in Southeast Missouri. Oil sand cores are here from Mexico, and Oklahoma, with the crevices in them from which the oil seeped when they were withdrawn. Here's a section of 6-in. core from an oil prospect in Montana, and next to it a smaller section of smooth sandstone brought in by a drill foreman returning from China.

American expert diamond drill runners have many a story of their ventures: of the fever-ridden West African gold coast, not so far south of the scene of Trader Horn's Adventures, "In the Earlies"; of working stripped to the waist in heat and in a constant flow of water in the depths of a Mexican silver mine; of hauling a drill up a glacier, and cutting a station 40 ft. in the ice to

prospect there for a mine; of looking for copper or gold on the Siberian Steppes with the thermometer at 60 degrees below zero, or hunting iron and coal in Central India with visits from tigers or cobras to relieve the humdrum existence of the diamond setter.

Back in the 50's, the French engineer, Le Schot is credited with inventing the diamond drilling process. In the late 60's M. C. Bullock and others began to develop diamond prospecting drills on this side of the water, and quarrying machines set with diamond heads were used, beginning with that period, in the Vermont and New York marble quarries. A diamond drill was on exhibit at the Centennial Exposition in Phila-

^{*} Sullivan Machinery Company, Chicago, Ill.

delphia in 1876. Albert Ball, chief engineer of the Sullivan Machine Co., of Claremont, N. H., was the inventor of the hydraulic feed for diamond drills, and numerous other devices and attachments. About 1880 some of these drills were sent to the Lake Superior iron ore ranges. Two of these machines were purchased by the White Breast Fuel Co., at Ottumwa, Iowa, and used by them for coal prospecting.

The demand for diamond drills grew rapidly. They were taken abroad by American mining engineers, and were shipped to practically all corners of the world where mining operations are carried on. By their use, capitalists on Wall Street, and bankers in Paris and London could learn, in a short time, with safety, whether mineral prospects in the Ural Mountains, in the Malay Peninsula, in the Andes, in Australia, China or Abyssinia, were of sufficient value to warrant development. On these findings hinged the financing and successful growth of some of the world's largest and best known mining operations. The diamonds themselves contribute to the interest and romance attached to this type of prospecting instrument.

The Carbonados or miner's diamonds, as they are called, are found, as every mining man knows, in one limited district in Brazil, and are mined in and adjacent to the beds of streams by methods similar to those used in Placer gold workings. The Cascalho, or diamond bearing gravel is washed in pans, and the diamonds or carbons thus sorted out. They look like gravel, and are noncrystaline in structure. The generally accepted theory is that they have the same ancestry, geologically, as gem diamonds, but have not progressed so far in their development.

At all events, they are the hardest known substance, and when set in the steel bit of the diamond drill, will cut any rock or other material encountered.

The size in which they are found ranges from tiny fragments up to stones weighing a considerable number of carats. Stones over three or four carats in weight are split up into cubical shapes for setting in the bits. Prices of diamonds have ranged from \$15 or \$20 a carat in the 80's up to \$125 to \$175 per carat at present.

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Prospecting on the Rand

(The following paragraphs are abstracted from reminiscences of the late Joseph S. Mitchell, at his death manager of the Diamond Drill Department of the Sullivan Machinery Co.)

"No chapter in the history of

mineral prospecting and development is more interesting or more romantic than that of the Rand mines in the Transvaal of South Africa; and not the least important part in this romance was that played by the diamond core drill.

"Back in the 80's, when rumors of gold in South Africa began to float about, many prospectors and miners made the long trek by ox wagon to the Transvaal to look the ground over. Some shook their heads and turned their backs on it; others stayed on in the hope of finding richer ore.

"The location was 1,000 miles from Capetown, and Capetown was 6,000

miles from Europe, the source of supplies, all of which meant a heavy outlay before any return could be had. It was not a poor man's camp and there was no certainty that it would be a success as a rich man's camp.

"The first mines, the Pioneer, Bonanza, Robinson, Ferreira, Crown Reef, and others, working on the richest ore, quickly established the fact that it was a profitable

Below, diamond core drill testing structure in the search for oil formation in Assam, India. The excitement of hunting oil is said to be "hard on the nerves" in the heart of the jungle where this hunt was going on. The drill man reported that the strain on the nerves of his crew, due to the proximity of tigers, snakes and other day and night hunters, made it difficult to make progress in the hunt for oil



Diamond drill at work boring a horizontal hole underground, Gold Coast, West Africa

An oil company exploring in the Punjab, India, became stuck at 4,200 ft. After a special trip, a diamond drill was purchased in the United States and transported to the hole, part of the distance by camel. This drill completed a hole to 6,007 ft. in 60 days, removing core for an accurate record all the way



Two of four drill outfits testing site for a U. S. Reclamation Service dam in the Black Canyon of the Colorado River near Las Vegas, Nev.

undertaking. While these mines were getting under way, and the town of Johannesburg was growing around them, prospectors were at work on the strike of the outcrop east and west of the camp. This exploration work proved that values diminished both east and west of the first workings.

"In the vicinity of what is now Johannesburg the reef outcrops on a ridge of the Witwatersrand (a Boer word, meaning White Waters' Range). The strike of the reef was east and west, dipping to the south about 45 degrees. The reef itself is a conglomerate consisting of water-worn quartz pebbles averaging about the size of a pigeon's egg embedded in consolidated sedimentary deposits. The gold occurs in the matrix, the pebbles showing no values, indicating that the gold was deposited at the time the conglomerate was formed or later by solutions.

"In the early days, mining men generally held the opinion that when the limits of free milling ore were reached at water level the reef would pinch out entirely or the refractory ore below would be barren. About this time Mr. John Hays Hammond, who was not so well known then as now, arrived at Johannesburg and began a careful study of the geology. His conclusions were that the possibilities of the reef continuing with values to depth warranted an extensive campaign of prospecting. He succeeded in interesting capital in his theory, with the result that the Rand Mines Co. was formed and took up immense tracts of land on the dip.

CORE DRILLING THE REEF

"Many of the mining engineers brought to the Rand to develop the properties were Americans, and they quickly realized the problem could be solved only with diamond drills. It was ten thousand miles to Claremont, N. H., the home of the diamond drill, but it was not long before drills and experi-



In northern Canada a diamond drill discovered what is supposed to be the largest deposit of china clay in the world

enced drill crews were on their way to the new field. After the first few holes were drilled the value of this type of drill in proving unerringly the depth, thickness and value of the reef was demonstrated beyond a doubt. From that time the diamond drill took up the task of prospecting and developing the greatest gold field and greatest mining camp the world has ever known. The work of the drills was progressive, the further afield they went the more they opened up. It mattered not whether the outcrop was covered by surface deposits and lost, or faulting changed the position; the drill picked up the reef, then moved along plotting it out and tracing it unerringly. When these drill records were on the table engineers never hesitated to proceed with development and installation of equipment, running into millions of dollars.

"Prior to the opening of the South African gold fields very little deep diamond drilling had been done. Anything beyond 1,000 ft. was considered very deep and drills had been designed for drilling moderate depths. After the outcrop properties on the Rand had been prospected, drills were started on the deep level properties immediately below the boundaries of the outcrop properties. This called for 3,000 ft., which considerably overloaded the machines then on the ground; but this was not the end. It was now proposed to drill on the second line of deep levels or what was known as the deep deeps. This required borings 4,000 to 5,000 ft. in depth, and Sullivan engineers were called upon to design a drill for handling a line of rods weighing 10 to 12 tons.

"Fractically all of the South African drilling was done by independent contractors. During the period of great drilling activity the demand for drilling outfits by the mining companies was so great that the contractors had a waiting list and very high prices were obtained. A 1,000-ft. hole was contracted for at about ten thousand dollars, a 4,000-ft. hole at fifty thousand dollars, and a 6,000-ft. hole at one hundred thousand dollars. In later years the prices declined to about one-half these figures. There is no better recommendation for the diamond drill as a prospecting instrument than the fact that the mining companies were willing to bear the expense of drilling through thousands of feet of hard rock to make the test of the reef with the drill.

INCIDENTS OF DRILLING

"The skilled labor on the drills was mostly American. Natives were employed as firemen, top men and helpers. The Boers were rarely employed on drills, as they would not do rough work and did not have sufficient experience to do the more important work. To them the diamond drill was a thing of wonder, the diamond bit cutting thousands of feet of hard rock seemed uncanny, and great depths were beyond their comprehension. A 20-ft. or 50-ft. water well to them was a big undertaking.

"The writer recalls an old bewhiskered Boer, a veteran of the war, riding up to the drill about the time the drillman began hoisting rods. He asked permission to remain and see the thing that did the cutting come out of the hole. His request was granted and he sat on his horse waiting. The rods were being pulled in 50-ft. lengths at the rate of one length about every two minutes. He watched the proceedings for an hour, then began to get fidgety, but hung on. At the end of the second hour his eyes began to stick out. At the end of the third hour he muttered in Boer a quotation from the Bible and started home. Until out of sight across the veldt he kept looking back and the rods were still coming out. His description of dia-



A diamond drill was used to bore holes in the foundations of St. Paul's Cathedral in London, through which cement grout was forced to arrest the settling of the foundation



A diamond drill crew at Cave City, Ky., endeavoring to reach Floyd Collins, whose imprisonment under a rock fall while exploring a cave drew widespread interest

mond drilling to the folks at home must have been interesting.

"During the Boer War, one of the first deep holes at the Truf Club, which eventually went to a depth of 5,202 ft., was interrupted by military operations. The type 'K' heavy duty diamond driil was partially dismantled and left on the ground. The hole was plugged with about 2,000 ft. of rods hanging in it. At the conclusion of the war, the contractors, Edward Chester & Co., reassembled the drill and renewed drilling operations without difficulty. The rods were found to be intact and in good order, and the hole had not caved or suffered other damage."

Over 300 diamond drills were employed in the development of the Rand gold camp in a period of a few years. Fifteen or 20 years later, many drills were shipped from Chicago to the Belgian Congo and are still in use, assisting in the development of the great copper mines of Katanga. In 1925 and 1926 diamond drills were found making borings in the vicinity of pre-historic native copper and gold workings on the Divide Country between the Nile and the Congo, hundreds of miles southwest of Khartoum.

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At the present time, Canada is perhaps the scene of greatest prospecting activity in which the diamond drill bears a part. At Rouyn, the new copper camp in Western Quebec, diamond drilling campaigns have helped to locate profitable ore bodies, and are used most scientifically to secure accurate information as soon as surface trenching has indicated possibilities. On Osisko Lake, a hole 2,500 ft. deep was completed last summer. This work was started on ice in the winter, and continued on piles driven when the ice went out. Light

gasoline engine driven rigs are favored for much of this surface work.

In developed mines, diamond drills find use for short prospect holes, bored horizontally, or at upward or downward angles to block out ore bodies in advance of development, thus giving the management full information and enabling them to avoid waste of effort.

Diamond drills have been used for numerous interesting purposes aside from mineral prospecting. When Floyd Collins was lost at Cave City, Ky., some two or three years ago, it was the diamond drill which was relied upon to locate his underground prison, and to establish communication.

Some years ago Butte copper mincs used diamond drills to fight fire by drilling bore holes into the depths of the mines through which water and steam were forced, to extinguish the underground flame.

DIAMOND DRILLING FOR OIL

It is probable that the design of the rotary drills used for oil well work was suggested by a diamond drill. But it was not until eight or nine years ago that the diamond drill itself was actually employed for oil field purposes. During the past three or four years it has proved an important addition to the facilities of the oil companies for exploration purposes. Drills capable of boring to depths of 1,000 to 2,000 ft. are employed by many companies to locate structure by boring until a keybed or marker is crossed, enabling the geologist to estimate accurately the depth of the oil sand from that point. When a number of these holes have been bored, he can readily draw a geological map and locate the high point of the anticline for production drilling.

Deep tests are also made with the diamond drill, and as an actual core is recovered one diamond drill hole frequently tells a complete story so far as the district or locality is concerned.

The oil field development has brought larger and more powerful machines capable of removing larger cores to greater depth. Oil field explorations have been carried on with diamond drills, not only in North America, but in many other parts of the world where petroleum deposits are being sought including Venezuela and Peru, and Algeria, and Portugese East Africa, India, and Borneo, Russia, and Persia.

Engineers use the diamond drills for test boring work upon the sites of proposed bridges, dams, reservoirs, docks, etc., the cores indicating the degree of solidity of the rock. The much discussed Boulder Dam location on the Colorado River between Nevada and Arizona was selected with diamond drills mounted on floating scows by which lines of holes were drilled in the bed of the stream in Boulder Canyon.

During the past year, Government engineers have employed the diamond drill to prospect for potash deposits near Carlsbad, N. Mex., and in West Texas. In this work cavities presented tremendous difficulties to be overcome, and the drilling crew were obliged to exercise every resource and every expedient in diamond drilling experience to get the hole down through these difficulties.

An entire chapter could be written on the clever methods and devices which necessity has developed to get the diamond drill hole in and the core out intact. As an instrument of precision the diamond drill takes first rank among prospecting and exploring methods in every branch of the mineral industry.

PRACTICAL OPERATING MEN'S DEPARTMENT



COAL

NEWELL G. ALFORD Editor

Practical Operating Problems of the Coal Mining Industry



SHOULD BLACK POWDER in BITUMINOUS COAL MINES BE PROHIBITED

By J. J. RUTLEDGE*

OR the first years of my experience the only explosive I knew was black blasting powder, and I observed its use by some of the most careful and experienced coal miners in the United States. During the succeeding years I had a great deal to do with the use of high explosives, especially dynamite, in metal mines, and for the last 20 years I have had experience with permissible explosives in

the coal-producing states of the SHOT-FIRERS' EXPLOSIONS

Union.

blasting coal covering most of

By shot-firers' explosions is meant the very sudden and extremely violent explosions which very frequently occur as shotfirers are engaged in firing black powder shots in mines where coal is blasted off the solid after all other persons have left the mine workings. Many such explosions occur in mines where no inflammable gas has ever been found, and are probably coal-dust explosions on a limited scale. The very great force of many such explosions

and the burned and blackened faces of the dead shot-firers indicate that such explosions are really coal-dust explosions. A contributing factor of great importance in such explosions is the firing of black powder shots in such rapid succession that all the dry and highly inflammable coal dust is stirred up and projected into the mine atmosphere, and the long, hot flame from successive powder shots finally ignites the coal dust and an explosion of great violence results.

Dangerous Practice In The Handling And Use Of Black Powder—Shooting Off Solid Is Extremely Hazardous And Has Caused Numerous Explosions-Undercutting Coal Has Decreased Explosions-Use Of Black Powder Should Be Discontinued



The Shot-Firer

Some of my experience at mine disasters, which were a direct result of the improper use of black blasting powder in coal mines, are noted below:

In State "A" there was an accident directly due to the explosion of a quantity of black powder while in transit in the mine workings, which explosion involved a payment for the damages that resulted in between \$400,000 and \$500,000 damages and the loss of a number of lives. Had the mining company not been a very large one and well capitalized, such a loss would have meant financial ruin.

In another field, in this same state, there is one district in which during last year almost 7,000,000 tons of coal were produced without the use of a pound of black powder. All explosives used were permissible explosives and all these were fired electrically.

In State "B" there have been a number of shot-firers' explosions,

> with the loss of life of one or two shot-firers at every disaster. besides the damage to the mine, loss of wages to the employes through enforced idleness as a result of stoppage of mine operation, damage to the mining property and loss on profit on the output to the mining company.

> In a certain mine in this state it was said that in 11 days' time 3,284 kegs of black blasting powder, of 25 lbs, each, were used for blasting coal off the solid. There was, it was reported, an average of 13 lbs. of powder to each shot. It was further said that 327 miners averaged one keg of powder per miner per day.

In one mine in this state (B) where all the coal was blasted off the solid, by means of black powder, the mine producing about 600 tons of coal per day and employing from 80 to 100 miners, it was the custom to run a miners' train to a town some distance from the mine after the hoisting of the coal had ceased. The mine stopped hoisting about 3.30 p. m. and the train left at 4 or 4.30 p. m., and yet it was commonly reported that the shot-firers, of whom there were several, did their work so rapidly that they were able to fire all their shots and board the train on the surface at the mouth

^{*} Chief Mine Engineer, Maryland Bureau of Mines, Baltimore, Md.
U. S. Bureau of Mines Photographs.

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of the mine before the train left. Naturally a shot-firer's explosion resulted with fatal results.

While with a party attempting to extinguish a mine fire in another mine in this state (B), the writer was startled by seeing one of the crew engaged in fighting the fire appear at the place where the fire was being fought bearing a keg of black powder in his arms, meanwhile shouting, "See what I found in the gob." The hose was immediately turned on the keg and the bearer, and when the excitement subsided it was found that the keg had been so heated by proximity to the fire that the japan on the exterior of the keg had blistered.

Apparently the full keg of powder, unopened, had been hidden in the gob by some miner. The mine fire had fortunately not extended to the point in the gob where the keg was hidden. This practice, it was said, was common at that time, although mine officials and the state mine inspectors had done their best to break it up. Doubtless many mine fires and some explosions resulted from such dangerous practices.

In State "C," where there are some very gaseous mines, and the coal seams are quite thick, it was the practice, while the entries were being started away from the shaft pillar, and before mining machines had been installed, to blast coal off the solid by means of black blasting powder. Of course, explosions were a result and several dead shotfirers. Later, when mining machines had been installed in these mines and the workings had been advanced some distance from the shaft bottoms, the writer frequently observed the ignition of the gas escaping from the solid coal in the faces of the entries from the flame of the miners' open lamps. The gas would be burning in a dozen places in the coal face and if not quickly smothered would ignite the coal and a dangerous mine fire would result. The gas was also frequently ignited by the flame from black powder shots. In such mines it would certainly be cheaper, as well as safer, to use flameless explosives and closed lights, if only to avoid mine fires.

In State "C" it was found necessary to adopt the use of shot-firers about 20 years ago, and since that time there have been a number of shot-firers killed, and such occurrences have taken place in regions where shot-firers' explosions were never known previously.

There is one region in this state (C) where the coal seam is of such nature and the miners so experienced that it is possible to blast coal off the solid fairly economically and with some degree of safety, provided shot-firers are employed. And yet, in this coal field, during recent years, some shot-firers have been killed either by windy or



Shot-firer testing for gas

blown-out shots, for the mines in this district are not known as gaseous mines and open lights are used exclusively.

However, with all the mining conditions favoring the blasting of coal off the solid with black blasting powder, this field was one of the strongest supporters of the shot-firers' law. If the use of black powder had not been dangerous, shot-firers would not have been resorted to. The adoption of the practice of firing all shots by shot-firers is an acknowledgment that the use of such an explosive is dangerous.

In State "D" very few mining machines were used. All shots were fired by shot-firers after all the other persons had left the working places. Shot-firer explosions were numerous, and have continued, though in much less degree than formerly, until within the last year or two when they have been reduced to a very small number. Considerable black powder is still used in the mines of this state.

The coal seams of this state are so cut up by horsebacks that the use of mining machines is said to be impracticable; hence nearly all of the coal in the state is produced by blasting off the solid, usually by the use of black powder. Shot-firers are used exclusively, and no shots are fired until all persons, except the shot-firers, have left the mine workings. In one mine alone, during the life of the mine-about 20 years-some 15 shot-firers have lost their lives as the result of successive windy or blown-out shots, almost exclusively from black powder. While some methane occurs in these mines, they can not generally be classed as gaseous. These explosions were undoubtedly due to the improper use of black powder.

In State "E" shot-firers are used for firing of shots after all other persons have left the mine workings, and this practice has prevailed for some years. All shots, by law, must be tamped and fired by the shot-firer. In some instances permissible explosives are used in the narrow places, while black powder is used in the wide places. A great many shot-firer disasters have occurred in the last 20 years.

A shot-firer's explosion occurred in a mine in this state (E), resulting in the death of two shot-firers, whose bodies were recovered only after great risk of life on the part of the rescuers. The mine, a large one, was so damaged by the explosion, that it was abandoned. It had previously been a profitable operation.

In this State (E) the introduction of permissible explosives was stoutly resisted both by coal operators and by miners, notwithstanding the greater safety and economy attendant on the use of the flameless explosives; the arguments advanced against their use by the operators were mainly the increased cost of explosives and the decreased amount of lump coal; those advanced by the miners were that the introduction of the new explosives disturbed existing contractual relations of the miners' organization with the operators and resulted in a reduction in the miners' earnings.

In one shot-firer's explosion, occurring in a large mine in this state (E), several shot-firers lost their lives and their bodies were only recovered after considerable risk of their lives by state mine inspectors and others. The cost of cleaning the mine and the damage resulting from the explosion was in excess of \$25,000; the loss in wages by employes who were laid idle as a result of the explosion was \$12,000, and there were also unknown but certain damages to be paid the dependents of the dead shot-firers.

In another mine in this state one entire side of the mine slope was wholly lost by reason of the damages caused by a shot-firer's explosion, and the bodies of the two shot-firers had just been removed from the mine when the entries affected by the explosion caved.

LONG BREAST AUGERS

After a mine explosion in a certain mine in this state (E) a breast auger was found that measured 14 ft. 8 in. in length and had means for fitting an extension. This was in a mine where the seam of coal was only about 5 ft. in thickness. In this instance, however, so far as could be learned, black blasting powder was not the explosive used, but a certain permissible explosive. An average loading of the drill-holes yielded by this long auger was 11 sticks of

1¼ by 8 in. permissible explosive. About 150 ft. of the mouth of this mine, which had a slope opening, had been blown off by successive shot-firers' explosions, much like the muzzle of an old Civil War musket which the writer carried on his boyhood hunts. The hazard of shot-firers' work in this mine was so great that professional shot-firers received an extremely large fee for assuming the work of firing the shots after the regular shot-firers' explosions.

An adjoining mine was opened during recent years by an intelligent, courageous superintendent, and mining machines were installed and all coal was blasted by permissibles, and for a considerable period of time this mine enjoyed the lowest accident record of any mine in the state. This demonstrates what intelligent management can accomplish in opening out mines.

PROCESS OF EDUCATION

In one portion of this coal field (State E) where black powder was used for blasting coal off the solid, there was, in some mines, a shot-firer's explosion at least once every month, several mine fires every week, often the destruction of many yards of canvas by flames from the explosions and usually a considerable area of the mine put out of commission by the successive explosions. Since mining machines and permissible explosives have been adopted, there have only been a few fires, no shot-firers' explosions and no cessation of work on account of explosions or mine fires.

In this state (E), the mining laws of which require that all shots be tamped by the shot-firer after all the other persons have left the mine workings, all shots in one entire entry were found to be tamped, after a shot-firer's explosion which resulted in the death of the shot-firer. The shot-firer on his rounds had not yet reached the entry where the tamped shots were found. In this case black powder and safety fuse were the explosives used.

Mine explosions, due to the use of black powder in an improper manner, occurred in the mines of this state (E) some years ago and have continued to the present. The lives of one, two, and in one case the lives of three shot-firers were lost in these numerous explosions, and not only were lives lost but the mines were severely damaged, and in several instances so completely destroyed that they were abandoned. In practically all of these instances the coal was blasted off the solid by means of black powder or dynamite and black powder. A number of these mines, where shotfirers' explosions had occurred, subsequently installed mining machines and undercut all coal and blasted the coal



Shot-firer attaching shot-firing wires to charge in hole at working face

so undercut with permissible explosives, and these mines have had practically no trouble since from shot-firers' explosion. One mine, having a very inflammable coal, is said to have blown up every frosty night; it is said that there are the graves of 22 shot-firers in the little cemetery near the mine. This mine afterward adopted the use of mining machines and permissible explosives, wet down each working place with hose and nozzle before firing any shots and had no trouble as long as the mine was thus operated.

In most of the shot-firers' explosions cited I am firmly convinced that inflammable gas did not have any part in the explosions—they were all due to what are known as "windy shots" or "blown-out" shots.

One field, where formerly very dangerous blasting practices prevailed, has recently installed mining machines and permissible explosives, with the result that shot-firers' explosions have ceased. Such was the danger and mortality associated with the work of the shot-firers in one important coal field in this state (E) that as much as \$30 per shift was paid the shot-firer for work which occupied his time for only two or three hours at the most. Again, in a few mines in this region, progressive mine managers introduced mining machines and permissible explosives and shotfirers' explosions ceased.

In State "F" the record is bad. Numerous shot-firers' explosions have occurred resulting in loss of life. Some of these occurred in the same mines after the workings had been cleared of the débris left by former explosions. One such explosion resulted in the loss of the tipple by fire resulting from the

explosion, as well as the loss of the lives of three shot-firers.

LARGER YIELD OF LUMP COAL WHEN
MACHINE MINING AND PERMISSIBLE
EXPLOSIVES ARE ADOPTED

An experienced coal miner of mature years and an official of the miners' organization once called my attention to a certain coal field in this state (F) where coal was being blasted off the solid by means of black blasting powder and dynamite. He was very much concerned as to the safety of the mine employes, owing to the exceedingly reckless use of powder and careless drilling of holes and firing of shots. Some of the drill holes in narrow work-the coal seam was scarcely 5 ft. in thickness-he declared were as deep as 12 ft. and of such large diameter that he was able to put his clenched fist in the mouths of many of the drill holes.

Mining machines adapted to the conditions in the field were installed and these machines cut the coal successfully, and the use of permissible explosives for blasting the coal that had been thus undercut resulted in practically the elimination of shot-firers' explosions. In this instance both operators and miners used good judgment in trying to do away with the evils of solid shooting with black powder.

This incident has been duplicated in a number of coal-mining regions.

When coal is blasted off the solid in this field with the use of black powder, the amount of small coal, including slack, nut and egg coal, amounted to 60 per cent of the total output. After mining machines had been installed and the coal blasted with permissible explosives, the percentage of lump coal was just reversed; that is, there was 60 percent of lump coal. It will thus be seen that the efficiency and economy were increased, as well as safety secured.

EVILS ASSOCIATED WITH PRACTICE OF FIRING ALL SHOTS BY SPECIAL SHOT FIRERS AFTER ALL OTHER PERSONS THAN SHOT FIRERS HAVE LEFT MINE WORKINGS

Recognizing and admitting the danger of firing black blasting powder shots. some coal-producing states, especially those in which coal is blasted off the solid by means of black blasting powder, have either by legislative enactment or by common custom, adopted the practice of having all blasting done by special shot-firers after all persons other than the shot-firers have left the mine workings. In a few states employing shotfirers the miners charge and tamp their shots and leave them for the shot-firers to fire; in other states the law requires that the shot-firer charge, tamp and fire all shots, the miner preparing the charge





Snubbing undercut coal preparatory to drilling shot holes

Miner drilling 6-ft. hole in working face

and leaving it for the shot-firer to charge, tamp and fire.

By this arrangement for the firing of all shots by special shot-firers, the public, the operators and the miners of the states where such practices are followed acknowledge that the use of black powder is dangerous, but, they reason, it is less dangerous to have such shots fired by experienced shot-firers after all other persons have left the mine workings, than it is to have the miners fire their own shots while all mine employes are in the mine. This is certainly the lesser of the two evils but many abuses arise out of such practices, among the most common being the following:

The miner, knowing that he will not have to face the danger of firing his own shots, frequently takes dangerous chances and drills holes that are very apt to result in explosions if they are charged and fired. Further, if he is permitted by law so to do, and often when the law specifically prohibits such practice, he charges and tamps the dangerous holes, knowing that he will be safe at home when his dangerous shots are fired. The poor shot-firer on his part, if the shots are tamped for him by the miner, must blindly accept the shot as a safe one to fire, as he can not examine either the charge or the drill-hole; too, often such shots result in explosions that cause the death of the shot-firer and wreck the mine workings. In at least one state a courageous state mine inspector - prosecuted successfully on a charge of manslaughter the miner who drilled and charged an unsafe shot for the shot-firer who was killed by an explosion resulting from this shot.

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But the operator, on his part, is often almost as guilty as the miner just referred to for he takes advantage of the law providing for shot-firers and declares that the shot-firer is the sole judge of whether or not a shot is dangerous and if the shot-firer thinks a shot is safe to

fire, it is no concern of his, the operator's. As a result of this attitude on the part of some coal operators and mine officials, very dangerous customs of firing shots have been permitted to become established in certain fields. Such attitudes on the part of operators and mine officials have resulted, in many mines, in an utter lack of discipline, so far as shot-firing is concerned. One or two states have recognized this lack of control of shot-firing by operators and mine officials and have provided for the certification of shot-firers by state mine inspectors or state mine examining hoards.

If those in charge of mines where shot-firers are employed would pay more attention to the preparation and firing of shots, not only would the quality of the coal mined be improved, but the work of shot-firing would be less hazardous than it is at present.

Mine officials and miners in fields where shots are only fired by special shot-firers are so familiar with and so accustomed to the dangerous character of such work that they can not conceive of men in other fields being rash enough to fire shots while all the mine employes are at work in the mine, even though permissible explosives are employed and electric means are used to explode the shots. Most assuredly they would not attempt to fire shots under such circumstances. The question as to which method of firing shots is safest is debatable, but there is never any question as to where the miner or mine official stands in such debate, provided they have had experience in regions where shots are only fired by special shot-firers.

SHOT-FIRERS' EXPLOSIONS USUALLY RE-

Almost invariably the shot-firers are killed by the violence of the explosions and the body or bodies of the dead must be recovered at considerable risk of life

on the part of those doing the recovery work. Shafts must often be descended in temporary sinking buckets, owing to the cages having been put out of commission by the explosion, and after the shaft bottom is reached all recovery work must be carried out in after-damp at risk of life, unless the rescue party is composed of well-trained and properly equipped rescue men. And even then there is great danger of loss of life. Those who have had to assist at such recovery work will testify to its difficulties, to the cries of the bereaved widows and children, the absence of trained rescue men and frequently the indisposition of such men as have been trained in mine-rescue work to don the breathing apparatus and to assist in the recovery work. Only those who have had to shoulder the responsibility of recovery work at a mine where a shot-firers' explosion has occurred can appreciate the worry and anxiety at such times.

But practically all who have had to carry the burden of such work are firmly convinced that black blasting powder should not be used in coal mines.

After experiencing for some years the results of the use of black blasting powder in blasting coal off the solid and also for blasting coal that had been undercut or sheared by mining machines, it is very difficult to write dispassionately.

DANGEROUS ANXIETY EXPERIENCED BY MINE OFFICIALS AND STATE MINE IN-SPECTORS WHEN BLACK POWDER IS EMPLOYED IN BLASTING COAL OFF THE SOLID

In all mines where the custom of firing all shots by special shot-firers, after all other persons have left the mine workings prevails, and especially where black powder and safety fuse are employed, there is intense anxiety on the part of the mine management and the mine inspector until the shot-firers report in safety at the mouth of the mine after firing all shots, and yet the troubles of the management and mine inspector are only half over since it is necessary to have one or more fire runners to inspect the mine workings after the shots have been fired, to detect and, if possible, extinguish any mine fires that may have resulted from the firing of the shots. This is another always present danger when black powder is used for blasting coal.

To one who has had an opportunity of observing the efficiency of undercutting the coal by mining machines in other fields and the blasting of all coal electrically and by the use of permissible explosives, it is inconceivable that miners and mine operators in other fields will continue the wasteful and dangerous practice of blasting coal off the solid by means of black powder and so-called safety fuse. Mine officials and mine operators never have any peace of mind while black powder is being used to blast the coal. And their minds are never even momentarily at rest until all the shot-firers and fire runners have returned in safety to the surface. The miner who drilled the holes for the shots and in many instances charged the holes also, is safe at home and in bed and free from the risk that the shot-firer runs. If there were no shot-firers and all miners prepared their own shots and fired them, using squibs, as was the practice until about 30 years ago, the miners would drill safer holes and would note that these holes were properly charged and fired and he would exercise far more caution than he does when shotfirers are employed.

It may naturally be asked, why continue to blast coal off the solid and to use such a dangerous explosive as black powder. The answer is that many mine managers believe that mining machines are not practicable in their mines, either by reason of the steep dip of the coal seams, partings in the seam, or poor roof. Other managers are firmly convinced that black powder yields more and better lump coal than permissible explosives and they are strongly of the opinion that to attempt to use permissible explosives would ruin their business as a result of the increased amount of fine coal.

Black powder alone is not so dangerous but it is the evil practices associated with its use that so greatly increase the dangers attendant on blasting with black powder. The most common of these practices is the blasting of coal off the solid and the use of squibs and safety fuse for exploding the charge of black powder. Under present conditions of coal mining and marketing, no coal should be blasted off the solid, as, under most favorable mining conditions, this is not only a dangerous means of mining

coal but also an inefficient and wasteful method.

Squibs are safer than fuse, but when ignited by the long hot flame of the miner's carbide lamp, there is very great danger of the horizontally held flame of the carbide lamp igniting the squib in the rear of the match and thus causing premature blasts with the result that the miner lighting the squib is either blinded, seriously wounded or killed. An electric squib is far safer than the common squib.

Safety fuse was probably introduced into coal mines by metal miners. It should never have been permitted to enter coal mines. Probably no other means of exploding black powder shots has caused more shot-firer explosions and injuries to miners than the mis-named "safety fuse." It may be serviceable in metal mines but so far as coal mines are concerned, the name "safety fuse" is certainly a misnomer.

When sauibs were used the miner or shot-firer could not take the risk associated with the firing of defective shots since the squib only permitted a short run before the blast exploded. The fuse, however, if it were cut long enough would permit the miner lighting the fuse to travel a considerable distance from the shot before it exploded. There is also the very dangerous practice of using insufficient lengths of fuse, or the failure to tamp the charges of explosive sufficiently, the firing of what are known as "Bob-tails" or "Skinner backs" and other local names for charges of explosives having insufficient tamping or insufficient fuse. All these accomplices of the criminal black powder have come into existence during recent years.

BLACK BLASTING POWDER DANGEROUS

Black blasting powder lends itself too easily to too many dangerous practices to be a safe explosive for use in bituminous coal mines. In the first place it has many dangers associated with its transportation to the mines and in the mine workings; a spark from a miner's lamp may ignite the powder spilt from a keg and cause an explosion. Furthermore, there are additional dangers while the black powder is being made into

In Mr. Robert Schless' article on "Necessity of Permissible Explosives for Bituminous Coal Mining," in our February issue, page 99, the statement "All fine bituminous coal passing a 200-mesh screen is considered as dust," etc., should have read, "All fine bituminous coal passing a 20-mesh screen is considered as dust."

cartridges, while the hole is being charged and tamped, and later when the shot is fired either by means of squib or safety fuse, there is danger all along the route and finally, when the blast is exploded there is great danger of the long hot flame resulting from the firing of the blast igniting any inflammable gas or dry coal nearby and a mine explosion will result. There is some danger associated with the use of all explosives but the danger connected with the use of black powder is greater.

On account of the dangers associated with the use of black blasting powder, and, although experienced many years in the use of black powder, I have become firmly convinced that black powder should not be used as an explosive in bituminous coal mines and that the abolishment of black powder and the practice of blasting coal off the solid is largely a matter of education of the miner and operator—mostly of the latter.

COAL NEAR SALINA, UTAH

INCE the settlement of the central part of Utah, about 1850, the thin beds of bituminous coal that crop out along the sides of Salina Canyon, a tributary of Sevier River, have been mined intermittently in a small way to supply the domestic needs of local residents, the showings of coal in Salina Canyon not having proved sufficient to encourage the development of large mines. The discovery in later years of large reserves of high-grade coal on the east face of the Wasatch Plateau has increased the interest of prospectors in this general region. After the presence and extent of the coal beneath the surface had been ascertained by diamond drilling, a mine was recently opened at the head of Salina Canyon, and it is expected that coal will soon be mined on a large scale.

The results of an examination of the Salina Canyon district by Government geologists are such as to encourage future development in the district, and a complete description of the geology and coal resources of the district is given in a report by E. M. Spieker and A. A. Baker, just published as Bulletin 796-C of the Geological Survey.

A summary of the reserves of coal in the district for which tentative estimates can be made shows that in an area of about 30 square miles 170,000,000 tons of coal is probably present. This area includes all the land in which workable coal may be presumed to be within reach of mines. Of the total amount more than 140,000,000 tons is estimated to be contained in one bed, tentatively identified with the Ivie bed, which is the most valuable bed on Ivie Creek, to the east

COAL, COKE and BY-PRODUCTION

By WILLIAM A. FORBES *

O SELECT for acquisition coal acreages to provide for the future supply of the various types of coking coals has involved much vigorous field work, laboratory study, and many experimental coking tests.

A laboratory for the specific purpose of studying coking coals was established at the time our first by-product coke ovens were built, to exclusively conduct such work as thorough testing of coal samples from diamond-drilling cores, or exploration samples, or mine samples, determining the theoretical by-product yields and probable coking qualities. These were followed by the actual coking of sizeable tonnages, to note the coke quality, and the

operating peculiarities of the coal in its passage through the carbonizing unit.

Many coal fields were thus tested, and before acreages were acquired a complete history and operating knowledge of its product was pretty well predetermined.

A very certain and efficient method for the testing of the coking qualities and by-product yields of coal was developed in this laboratory, which method is now standard.

Much auxiliary work has been done, such as X-ray analysis of coal, observations of oxidation and weathering rate, factors influencing coking properties, and beneficiation studies, both in the laboratory and in the field, in testing of coals for improvement in their composition and quality, by cleaning by various methods.

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In coal-mining operations it is the custom to sample working sections of all the mines. Any section of the mine found to be high in impurities is given prompt attention, and in a number of cases where sulphur or phosphorus proved high the output has been either reduced or loaded separately for the purposes for which it is considered satisfactory. At many coal mines domestic water supply is local; that is, it is obtained from springs or water wells in the vicinity of the towns. If, after being analyzed, any source of water supply is found to be unfit for domestic use, the spring or well is de-



Typical Blast Furnace at One of the U. S. Steel Corporation Plants

Editor's Note.—An extract from a paper presented by Mr. Forbes, October 28, 1927, to the American Iron and Steel Institute, entitled "Technological Problems of the Steel Industry." Mr. Forbes is assistant to the president of the U. S. Steel Corporation, and for years has been intimately associated with the study of these problems about the selection, production, and utilization of metallurgical purpose coal herein discussed. As showing the value and possibilities of investigation in coal production it is recommended for careful reading by the operators of commercial mines.

stroyed or closed. Water is also analyzed for boiler purposes, and the air in the mines is given careful and frequent analyses.

A creditable investigation is the long study and money outlays made for building experimental plants for the treatment of acid mine waters, which problem has received the utmost consideration. In treating these mine waters a by-product has been obtained in the form of a hydrated oxide of iron, though the low price of this by-product recovered is too small to balance the cost of operations.

CLEANING OF COAL

Comprehensive studies of the various coal-cleaning methods have been conducted, and actual tests of coal from

many fields have been made on the various equipment for mechanical cleaning, including the wet, dry, and pneumatic processes. All principles for the reduction of impurities in coal are based upon differences in specific gravity between clean coal and impurities. The most successful plans for improving the quality of coal are based upon the flotation method of employing the difference in specific gravity. Of these, in large-scale operations, water flotation and air flotation are the two which have so far met with the greatest success. The advantages of each as compared with the other are as follows:

For Water Flotation.—Ability to treat greater variation in size; in other words, to treat

as small-size coal as, and larger-size coal than, air flotation.

Ability to treat coal in greater range of sizes in one operation (viz, in one jig or table), resulting in less screening required.

For Air Flotation.—Avoidance of added expense on account of added moisture, either for transportation of the extra weight or for evaporation in use.

An example of results obtained in the water flotation process, as conducted by a company washing large tonnages of coal, is shown in Table I for the year 1926, where, in order to secure as low ash as possible in the coking coal, the bone or intermediate coal was also removed in the washing and used for boiler purposes.

No individual cleaning process can be claimed to be most suitable for all coals and all conditions. The choice of method will depend largely upon the efficiency of separation required; that is, whether a product of given quality will be satisfactory, or whether the maximum possible purity is demanded. Other factors that enter into the choice of any process are:

Maximum price that the consumer is willing to pay for the cleaned product.

Ability to secure and impound an abundant and cheap water supply.

Occurrence of impurities; i. e., whether freely associated or closely combined with the coal.

^{* 71} Broadway, New York City.



Coal washing plant operated by subsidiary of the U.S. Steel Corporation

Distribution of impurities; i.e., whether uniformly distributed through all sizes, or greatest either in coarse or fine coal.

Possibility of a market or outlet for a middling product, thus enabling the cleaning plant to secure the cleanest possible coal, and the least wasteful reject.

It can be said that all of the treating processes will provide a more uniform product, by reducing the ash and sulphur content, and that a combination of the wet and dry systems would give better results on some coals than either all wet or all dry processes on the same coals. Therefore, each installation must be considered separately, and the best process selected to obtain the results desired, considering at the same time the added installation and operating costs.

UTILIZATION OF COAL MINE DUMPS

Laboratory work involving the utilization of waste materials which have resulted from mining operations has recently developed a processing system to make a commercial and salable building article from the slaty material occurring in the burnt-out refuse dumps, in certain favorable districts.

This material, consisting chiefly of calcined fireclay, is crushed, sized, and treated to produce roofing granules or coating materials, of several shades of red and brown. In the treatment process spent pickling liquor from steel mill operations is used to a considerable extent. Thus by a happy combination two waste materials are brought together to pro-

duce a high-grade, and an unusual and popular colored, roofing element.

The patent application covering this conversion process is pending, and the outlook for the practical manufacture of this article is promising, thus by science two of the lesser by-products or waste materials are combined to become a merchantable commodity.

COKING PROPERTIES OF COAL

The coking properties of coal have, we believe, received more intensive study than any other quality of this important commodity, and accordingly we will detail some interesting laboratory and field facts, developed after two years of work. This coking property of coal varies with different kinds of coal, it varies with coals from the same seam and mined within comparatively close ranges, and it varies with different conditions arising in the actual coking operations. It is well known that, even in coals of practically the same analysis, the coking property is not necessarily even approximately the same, as is shown by the actual operating and laboratory data on two similar coals from different districts and different seams shown in Table II.

From these analyses it is reasonable to assume that, by subjecting these two coals to exactly the same operating conditions, cokes of similar characteristics would be produced. That such an assumption is not borne out by actual results is shown by the following data obtained from the operation of a series of test ovens under the same normal plant conditions.

The coke from Coal No. 2 produced an excellent grade of metallurgical fuel, while the coke from Coal No. 1 differed entirely in physical properties, and was of no value as a blast-furnace coke. In the case of this coke, it was almost impossible to push it from the ovens without crushing the entire mass, yet the contraction of both coke masses was almost identical. It can not be said that Coal No. 1 did not possess fusion properties, as the coal mass was thoroughly coked, yet the physical properties of the resultant coke show conclusively that these fusion properties were not similar.

The scope of extensive experimental studies, carried on at a large by-product coke plant dealing with the production of

TABLE I

RAW COAL					BOILER COAL						
Washer	Vol.	F. C.	Ash	Sul.	Washer		Vol	. F. C.	Ash	Sul	
No. 1	$\begin{array}{c} 27.48 \\ 27.61 \\ 26.51 \\ 25.34 \end{array}$	56.85 62.25 60.93 61.46	15.67 10.14 12.56 13.20	1.44 1.43 1.59 1.86	No. 1		26.0	59.80 60.85	13.05 14.20 13.10 13.68	1.62 2.00 2.03 2.20	
						R	EFUSE				
WASHED COAL				Float at 1.37 Sink at 1.37							
Washer	Vol.	F. C.	Ash	Sul.		%	Ash S	ul. %	Ash	Sul	
No. 1	30.79 29.13 28.67 27.77	65.29 66.23 66.72 67.71	3.92 4.64 4.61 4.52	1.09 1.17 1.22 1.28	No. 1 No. 2 No. 3 No. 4	4.2	4 79 1. 4.92 1.	10 96.1 27 95.8 35 95.1 48 95.3	70.62 61.83 63.33 56.00	2.1 4.6 4.0 5.2	
;	. 1	Raw coal tons		Washe coal to		Boiler coal tons Percer		t Refu		ercen	
No. 1	******	240,200 696,903 1,178,754 491,923		188,89 580,67 960,96 399,88	3 83.32 5 81.52	15,358 50,900 80,647 32,373	6.39 7.30 6.84 6.58	35,9 65,33 137,14 59,60	30 12 1	4.97 9.37 1.64 2.13	
No. 1 Washer effici No. 2 Washer effici No. 3 Washer effici No. 4 Washer effici	ency 90 ency 90	.2% b	ased or	4.20%	inherent ash	in coal.					

Analysis (Proximate)	Coal No. 1 Percent	Coal No. 2 Percent
Volatile matter	33.75	33.05
Ash	9.51	9.12
Fixed carbon	56.74	57.83
Sulphur	1.24	1.25
Analysis (Ultimate)	2000	
Carbon	78.38	78.53
	5.06	5.10
Hydrogen	4.22	4.50
Oxygen		
Sulphur	1.24	1.25
Nitrogen	1.38	1.50
Chlorine	.17	.11
Phosphorus	.035	.015
Yields (Laboratory distillation test)		
Coke	73.4 percent	73.6 percen
Tar	9.4 gallons	9.6 gallons
Ammonia (NH ₂)	6.1 pounds	6.4 pound
Light oils.	3.7 gallons	8.7 gallon
Con	12.260 cu. ft.	12.944 cu. ft.

TABLE II

a metallurgical coke from high-volatile coal, and practical operating data gathered therefrom, show a decided improvement in the quality of the blast-furnace coke has been obtained as evidenced by the physical properties of the coke and its reaction to blast-furnace operations.

To produce improved quality of furnace coke, actual oven tests, under operating conditions, were required, and for approximately two years this work has been steadily carried forward. It was necessary to produce coke from different coal mixtures, employ different temperatures, different sizings, and different coking times, and to carefully correlate the coke plant operation with the reaction of the blast furnace, and establish a definite relation of the variables which produced either a good or an unsatisfactory blast-furnace fuel.

That a better metallurgical fuel is being produced from the same raw material is definitely shown by the operation of the blast furnace. By suitable segregation of the coals and close temperature control, the production of this improved fuel could be continued, but it was not understood why coals of apparently the same composition should produce such different qualities of coke.

On reaching this stage of the study, determinations of the melting point, or plastic stage, of the coal were made. In this determination the resistance of the coking mass to the flow of inert gases is measured under carefully standardized conditions. This, too, at first seemed unreliable, but by plotting these results and comparing them with the physical quality of the coke, and the operation of the blast furnace, a definite relation was found to exist between them.

By adjusting the carbonizing temperatures of the ovens it was found that the physical properties of the coke were immediately improved and the blast furnaces on this coke responded correspondingly, indicating that the coke quality had been actually improved by a knowledge of one of the coking properties of a coal, its melting point.

It would now appear pretty sure that the melting point, or plastic stage, of the coal is a very important factor in its coke-producing qualities, and probably the best index in selecting high-volatile coals for the ovens. Some coals begin to gasify at 420° C., others at higher, and some at lower temperatures, and this melting point characteristic has now been found to be so important, as developed in conjunction with practice, that great care is exercised in mixing coals from various mines, so that only those of approximately the same melting point are used together. By segregating the coals in this manner, and by corresponding temperature control of the ovens dur-



Battery of by-product coke ovens at one of the U.S. Steel Corporation plants

ing the coking period, an improved metallurgical coke product is obtained.

Further work is in progress to establish a definite relation expressable, if possible, in figures to show the influence of the melting or decomposition point of coal, and its resultant behavior on coke structure and blast-furnace reaction.

By-PRODUCT COKE OVENS

By-product coke from the quality standpoint, in preference to beehive coke, for blast furnace and foundry use, is now so well recognized that there is no need to dwell upon this subject. The by-product coke oven operator, as heretofore stated, is continually endeavoring to further improve the quality of his coke by suitable technological studies of coals available, temperature control at the ovens, coking time, etc., with corresponding observation and attention as to their effect on yields and quality of by-products.

Technological studies extended to the oven proper, or retort, have been principally in the direction of greater tonnage capacity, and this has been effected by gradual but sure development in the dimensions of the ovens, allowing more coal per charge, and also in the reduction in the coking time per charge, the net result being that a modern by-product coke oven can now produce about twice as much coke per 24 hours as an oven, modern at that time, could produce per 24 hours in 1909. Naturally, considering the heavy investment involved in a by-product oven, changes in dimensions have been conservatively made. The growth and development of the by-product coke industry in the United States has been very large, as is evidenced by the production of 5,607,899 net tons of by-product coke in 1907, while in 1926 the production was 44,376,586 net tons.

The success of the steel industry in increasing its by-product coking operations will no doubt gradually extend in other directions, and is today a significant educational factor that more coal should be processed for general public use. Approximately 85 percent of all by-product coke made in this country today

is being produced for metallurgical purposes.

A technical advance in operation of some by-product coke-oven plants, particularly those supplying gas for municipal purposes, is the heating of the ovens with coal-producer gas, thus conserving for the above purpose the entire production of the higher heating value cokeoven gas. Similar conservation of the high-value gas from the ovens is accomplished at some European plants by employing blast-furnace gas as the heating medium for the ovens.

Studies are being made of improved methods of recovering phenol constituents from the waste waters of coke plants in order to prevent the pollution of the streams into which they flow. Extraction plants have been built at considerable expense by the steel industry at various points, in endeavors to commercially overcome this condition; although successful in preventing entrance of the phenol into the streams, there are as yet no financial profits from the operation.

Desulphurization of coke-oven gas is one of the technological studies not yet completed, which occupies an important position at the present time, particularly the effect it will have in rendering coke-oven gas more suitable for the production of low-sulphur steel in open-hearth furnaces.

COKE BY-PRODUCTS

A certain amount of concern has been expressed from time to time as to the ability of the market to absorb the large quantities of by-products recovered in making by-product coke, to wit, tar, gas, ammonium sulphate, and benzol. So far, all these by-products have been readily and profitably absorbed and we see no reason why this condition should not continue.

Benzol products have been removed from our coke-oven gases since 1915, when war measures hastened the installation of plants which had been earlier recommended.

The country's production of these aromatic hydrocarbons in 1926 totaled

132,843,665 gallons, practically all recovered from its metallurgical coking units.

Improvement in quality and yield of by-products has been one of the slogans of producers for years, resulting in the production of, for instance, ammonium sulphate from coke ovens, equally as good and as greatly in demand as ammonium sulphate synthetically manufactured from atmospheric nitrogen. Improvements, also, in the refining of other by-products such as motor benzol, pure benzol, toluol, and solvent naphtha permit the production of high-grade noncorrosive and odorless products, thus removing the former principal objections to these commodities.

A close study is being given by the steel industry to the problem of tar and the most profitable disposition of this useful commodity by distillation or otherwise.

Continual study is also being made by the steel industry of the development and use of other by-products than those already referred to, which are recoverable from coke ovens; for instance, cyanides, alcohols, and the various by-products of tar distillation.

ECONOMICAL BURNING OF GASEOUS FUEL

It has been developed at certain works that greater economy in burning cokeoven gas in heating furnaces of various types is accomplished by furnishing the gas to the burner system at a uniform pressure of from 10 to 15 pounds, this gas utilizing the pressure to inspirate a correct volume of atmospheric air for proper and efficient combustion. This practice resulted in a very marked increase in production, with a correspondingly great reduction in the gas used per unit of product. At the same works certain type heating furnaces and soaking pits were equipped with the low-pressure system, where fan air, at 1 to 1.5 pound pressure, inspirates gas at about atmospheric pressure, resulting also in increased production and decreased fuel consumption.

In utilizing a correctly proportional and homogeneous gas and air mixture, the amount of waste gases is a minimum, and the heat generated a maximum, or, in other words, the available heat is high. This system of fuel application may be considered more economical on small forging and heating furnaces, and large continuous furnaces which are designed for waste gas temperatures below 1200° F., than on similar furnaces equipped with regenerators or recuperators. Even on the direct-fired soaking pit, where the waste gases leave the pit flue opening above 2000° F., the economies are apparent. In addition there is lower scale loss and better and more uniform heating.

LOW-TEMPERATURE CARBONIZATION OF

We can not well leave the subject of coal and by-product coke without dwelling at some length on the features of low-temperature carbonization.

Interest in the low-temperature carbonization of coal ebbs and flows according to the relative enthusiasm and aggressiveness of the parties carrying on development work. Very few new discoveries have been made that indicate it has any immediate commercial value to us in this country.

The primary object of the method is to transmit heat to the coal at a rate which will prevent the decomposition of the primary tar oils and gas. The temperatures used seldom exceed 1200° F., as distinguished from high-temperature carbonization of 2000° F. or more.

As in most matters, the economic necessities either make or eliminate the possibility of commercializing an industry or product; and while it was thought by many at the close of the war that there was a great opportunity for lowtemperature distillation of coal in this country, other economical factors seem to have changed that condition very materially. The tremendous increase in the production of natural oil and surplus capacity of both the bituminous and anthracite mines of the country make it very difficult for a comparatively untried industry to survive the commercial competition.

Without reviewing the literature on the subject, and the character of the products produced, it is not difficult to see that the so-called smokeless semicoke will have a difficult time to compete with either the soft or anthracite coal markets as fuel for domestic purposes in this country. The character of the oil produced by the process, however, has a chance, because of the large yield of creosote oil in the tars produced, but even at prices higher than are now obtainable for creosote oil, unless the residual coke can be marketed, a plant practicing the method could not survive.

The above being true, there appear to be only two channels that might be of interest at the present time. One is the use of the process in some stage of the complete gasification of coal, and the other would be to practice the method for recovery of the oil products, and immediately burn the residual coke to produce power.

Undoubtedly many observers will take exception to the above statements. Naturally the conclusions are influenced by local conditions, but in trying to analyze the relative value of the process one must have an economic incentive which will act as a yardstick. Conditions in the United States are distinctively different from those in Continental Europe or Eng-

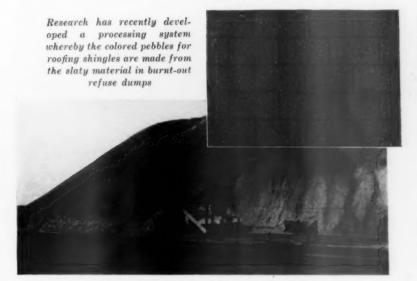
land, and cause for enthusiasm over there would have no foundation here. In Continental Europe, particularly Germany, the motive is the production of oil, because it is a nation that imports most of the oil it consumes; while in England the use of devolatilized soft coal for house heating purposes, plus the value of the oil, is an incentive to perfect a process that could be commercially operated. Probably more actual research work is being carried on in Germany and England than in this country-or at least it is receiving more consideration on the part of coal producers, and capital, and governmental departments, in the hope that something of economic value may be developed.

Since the war practically all development work in the United States has been carried on by private parties or corporations. One of the great troubles with low-temperature distillation methods up to the present time has been the high capital investment necessary per ton of capacity, particularly when a capacity was compared to high-temperature methods, such as are practiced in the byproduct coke oven.

There are several processes which are more or less familiar to students of low-temperature distillation in this country because of the publicity that has been given them during the development stages.

Viewing the subject from the oil and fuel standpoint, if the fuel is to be marketed in competition with coal, and the manufacturing method discharges it from the retorts in a finely divided state, it necessitates briquetting. This adds operating charges, probably prohibitive, which will have to be absorbed in the selling price. Viewing this type of apparatus and method from the standpoint of complete gasification means that the finely divided coke would have to be converted into either producer gas or water gas, and in most instances would not be suitable fuel for gasification in either standard producers or water gas machines, because of the operating characteristics of those machines. Therefore, the better method of utilizing this finely divided coke would seem to be to burn it as soon as it is produced for the generation of steam for power.

In those processes and apparatus which produce a large-sized coke structure two difficulties present themselves. One is that generally the coke structure is very soft and will not stand transportation to the ultimate market. This is particularly true of the domestic market, in which coke requires handling many times before it is at the point of consumption. This, of course, excepts the briquetting method. The other is the high capital cost per ton of capacity.



When viewed from the gas-maker's standpoint, if the method used produces a coke structure that would be available for either producer or water gas machines, a large yield of low-heat value gas will result.

Complete gasification of a good grade of bituminous coal will give from 45,000 to 50,000 cubic feet of 370 to 385 B.T.U. gas per ton. While this gas is satisfactory for industrial applications, it is too low in heat value to be distributed in existing pipe lines for consumption either industrially or domestically. This adds the feature of enriching the gas to the requirements of whatever locality the plant is to be operated in, and a further cost must be added to the finished product to bring about the enrichment by carburized water gas, or by standard water gas method.

Considerable progress has been made in the production of commercial and industrial gas by the use of bituminous coal in water gas machines. A large yield of water gas having a heating value of 310 to 320 B.T.U. can be obtained by this method, and it is questionable, particularly in small plants, whether low-temperature distillation, in combination with water gas machines using the residual coke, can manufacture gas any cheaper than is being done at the present time.

The above indicates that it is going to be necessary to have developments in auxiliary or allied industries to compensate for the shortcomings of low-temperature distillation in order to make it succeed. One requirement would be the development of a cheaper method of enriching gas, to raise the heat value from the low-temperature distillation, and gasification of the resultant coke. The other would be to get large capacity at low capital investment of the low-temperature distillation part of the practice, so that the generator fuel would be pro-

duced cheaper than it is now obtainable.

However, the discovery of a method of producing cheap enriching gas is going to be equally beneficial to the gas industry, as it is now being practiced. All it would involve would be the elimination of the carburetors from the generator sets and mixing, at some point, the enriching gas.

The above conclusions would not necessarily hold true where low-heat value gas could be used, such as metallurgical and industrial plants. Complete gasification is now being practiced in these plants by the use of the well-known coal gas producers.

It will be very difficult to economically practice low-temperature carbonization in small installations. Therefore it would appear that it will only be at the largescale metallurgical operations where large enough installations can be made to get economical operating costs. As the market for the large plant is limited. and the smaller type of plant would be too costly as compared to present methods of taking care of these problems, we are led to believe from what is known at the present time that much more development work will be necessary in order to show the value of low-temperature distillation of coal in America.

Much interest is being displayed throughout the world in the operating results that will be obtained from the large plant now being constructed in Germany to utilize the Bergius process, this process being one whereby the coal is converted into oil by hydrogenation, when brought into contact with hydrogen gas at relatively high pressures and temperatures. If this process is developed to a point where oil can be produced on an economical cost basis it may develop that it will be cheaper and better to convert the coal into oil, and in turn make oil gas, than it will to practice the low-temperature distillation method.

In view of the fact that a ready market must be obtainable for the by-product fuel produced by the method, another factor has developed in domestic heating which contributes great resistance to the low-temperature type of coke fuel, moving in its normal market. This is the automatic oil heating which is constantly becoming more popular, and with the cheap oils and the cleanliness of this method of producing heat for the home, and the automatic feature, it offers many benefits that can not be expected from the use of low-temperature coal.

All development work that has been, and is being, carried on naturally will be of material benefit in the future. It will show the way to the solution of the fuel problems that we must face in the future; and while the immediate development work probably will show no commercial profit for some time, when the day does come to meet new conditions, necessitated by the decline in the supply of fuel oil and the exhaustion of the anthracite coal reserve, sufficient knowledge will be at hand to successfully obtain substitutes, and the possibility of low-temperature methods being valuable, will show at that time.

WORK OF CHIEF MINING ENGINEER

(Continued from page 161)

neer. The cooperation is unique among international relationships and has proven of greatest value. Where one side of the cooperation has been ahead in a particular line of investigation the data obtained immediately become available to the other side. The interchange of personnel in research, which is part of the plan, has been inspirational to both sides. In matters of mine safety there can be no questions of politics or commerce. Hence there is no fear of controversies involving either the cooperating countries or others, and the relations established are indirectly of value through increasing international friendships.

ACCIDENT PREVENTION IN BUTTE MINES

(Continued from page 163)

parative accident statistics of the mines, shops, and smelters, with an additional special page for an honor roll of shift bosses who go through one or more months without a lost-time accident to anyone on their respective crews. The crew having the largest number of accumulated shifts without a lost-time accident is given the honor of having its picture published in *The Anode*, and not infrequently several of these crews will build up an accumulation of more than 10.000 shifts without an accident.







Fig. 9

SELECTING MOTIVE POWER and TYPE of LOCOMOTIVE

By ARTHUR C. GREEN*

HEN one considers that the total world tonnage of coal and lignite produced in 1926 was 1,493,616,000 tons, and the total freight tons originated on the Class I railroads of the United States during the same year were 1,337,000,000 tons, a somewhat adequate conception is had of the underground haulage problem. Great quantities of iron, copper, lead and zinc

ore are transported underground; also

the tonnage of salt transported under-

ground and the tonnage of gypsum rock

transported underground are large.

Underground haulage problems are complicated by a great variety of gauges running from 18 in. up to standard gauge (4 ft. 8½ in.); also by a multiplicity of clearances. Entries, or roadways, vary from 3 ft. in width to 24 ft., and in height above the rail from 28 in.

Haulage Factors Discussed—Types Of Main And Gathering Locomotives— Service Required Of Each Type— Comparisons Between Gathering Reel And Storage Battery Locomotive— New Type Of Permissible Reel Locomotive For Dusty And Gaseous Mines

to 28 ft. Some of the clean Utah seams run 28 ft. in height. In some mines roadways are graded, while in others locomotives and their trains are expected to negotiate hilly roadways.

There are two distinct branches of underground haulage. One is "Main Line Haulage" and the other is "Gathering." It is difficult to cover all of the factors that have to deal with arriving at the proper type of locomotive to be used. Some of them, however, should be mentioned and to a certain extent some factors are common to both classes of haulage. Those factors which are common to both classes of haulage are:

Gas, dust hazards, length of haul now and in future, grades now and in future (from drill records), capacity and weight of empty cars used, types of car bearings, gauge of track, weight of rail used, minimum radius of curves, tie spacing, clearances, roadways wet or dry,

tonnage per shift, length of shift, number of shifts per 24 hours.

Direct current only is used underground for trolley locomotives, gathering reel locomotives and for charging battery locomotives. Generally speaking, therefore, the question of the power available such as capacity of the motor generator sets, should not be allowed to become a deciding factor. This is often done and it is a mistake. In some cases, the present generating capacity has been taken into consideration too heavily in determining the type of haulage equipment to purchase. Permitting such present expediency to effect haul-

* Manager, Central District, Goodman Manufacturing Co.

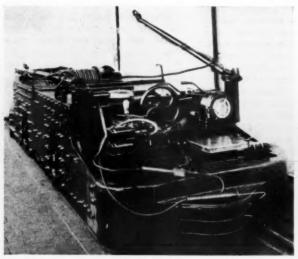


Fig. 2



Fig. 7



Fig. 5

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age costs for the life of a mine is not to be advised; therefore the statement made before; namely that the question of amount of power available such as the capacity of the motor generator sets, should not be allowed to become a deciding factor, is basic. We must assume therefore that for efficient and low cost transportation sufficient power will be available. If we assume, therefore, that ample supply of power is available, our problem after considering the factors mentioned above is to decide what speed in miles per hour will best fit. The next step is to determine how many cars per trip can be most economically pulled. Knowing the number of cars per trip together with the allowable speed, we can arrive at the number of trips per shift that will be required to transport the tonnage desired per shift. Knowing the number of cars per trip and having a definite knowledge as to the grades both with and against the loads and giving account to future requirements and knowing the type of car bearings used and the friction per car, the required drawbar pull can be computed. Having this figure which determines the weight of the locomotive required, a duty study is made, based on a full shift's cycle of operation. This study gives the continuous duty on the motors and the proper horsepower with which the locomotives should be motored. Many locomotives are under-motored, largely because the

continuous duty on the motors was never figured. This is basic—the continuous duty on the motors must be known.

As the tonnage of coal transported underground greatly exceeds the tonnage of other minerals, and, keeping the coal problem most in mind, although there are phases in this problem that apply in most mining layouts, most main line locomotives or main haulage locomotives are trolley locomotives and should be. (Figure 1.)

Generally speaking, storage battery locomotives should not be used for main haulage work, because of the fact that it is normally not practical to super-impose on such a locomotive a battery of sufficient capacity to negotiate a haul of any appreciable length.

One way of visualizing the problem is to consider that a certain number of tons of coal or ore, plus a certain number of tons car weight, are to be transported from one point in a mine to another. Knowing the number of cars per train, the number of times the locomotive must go over the road per shift can be figured. If the locomotive has to go over the road 15 times in a shift, then 15 times the locomotive's weight must be added to the total weight of cars and ore or coal. Knowing the type of bearings used, the drawbar pull from these items can be determined. This multiplied by the number of feet to be hauled gives the total foot pounds of work. From this product the number of kilowatt hours capacity of the battery can be determined. It is therefore evident



Fig. 3



Fig. 4

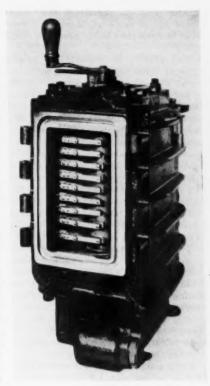


Fig. 6

that the two principal factors having to do with the battery capacity required are the number of feet to be hauled and the drawbar pull in pounds.

Battery locomotives generally are built to have a speed at full drawbar pull of 31/2 to 4 miles per hour. Most main line locomotives of the trolley type have a full drawbar speed of 7 miles per hour, and the latest practice in main haulage, with improved roadbeds and heavy rails is to use a speed at full drawbar pull of from 10 to 20 miles per hour. One recent installation in a large lead property where the hauls are 31/2 miles in length and 70-lb, rails are used on a rock bed, speeds of 20 miles per hour have proven correct. This company now has in service on this good underground railway, 31 high-speed 13ton main line trolley locomotives.

Summarized, therefore, knowing that a main haulage locomotive should be a trolley type of locomotive, the main points to decide are the most economical size of locomotive to use and the proper horsepower in motors with which to equip this locomotive. We may safely eliminate storage battery locomotives as far as main haulage duty is concerned. Quite frequently it is expedient to use instead of one heavy locomotive, two small locomotives in tandem. The reasons usually for going to tandem unit rather than a single unit are short radius curves and inadequate clearances for a

large locomotive. In cases where long grades must be negotiated and where these grades are heavy enough to warrant it, dynamic braking should be made use of.

The problem of choosing the proper type of gathering locomotives is somewhat different. There are two main types of locomotives used for gathering work; one is the gathering reel type of locomotive, the other is the storage battery type of locomotive. There are several subdivisions in each type; for instance, the gathering reel type may be subdivided into: standard speed gathering reel locomotive, slow speed gathering reel locomotive, also slow speed type of gathering reel locomotive equipped with a crab reel, standard speed type of gathering reel locomotive equipped with a crab reel.

The battery gathering types of locomotives can be divided into: straight
storage battery locomotives, and combration battery and trolley locomotives.
Both gathering reel locomotives and battery locomotives are made in what is
known as the open type and in what is
known as the closed type. The closed
type is usually specified where gas exists or where the mines are dusty.

For a number of years it was thought that enclosed storage battery locomotives were more safe in gassy or dusty mines than a gathering reel type of locomotive. The storage battery which represents the greatest hazard on a battery locomotive on account of its weight and size offers an almost impossible problem in providing further safeguards. It is susceptible to falls of rock which may cause fires near the roof where gas is more likely to be present and these fires are very difficult to extinguish because the power can not be shut off. The hazard of a reel and trolley locomotive is in the cable flashing which may occur by the cable being run over, but this flash occurs on the bottom where there is seldom any gas even in very gaseous mines. In removing the hazard from the top of the mine to the bottom the danger from explosions is reduced. Recent developments, however, in the gathering reel type of locomotive are changing this attitude. It is opportune at this particular point to describe rather fully a new type of gathering reel locomotive now being built to operate in mines where safety is of primary importance. This new gathering reel locomotive is an 8-ton locomotive (see Figure 2). Its reel is operated by a separate motor. Figure 3 shows the motor shell which is not of the split type but is of the new solid type with removable end plate. Figure 3 shows the inspection cover locked tight, while Figure 4 shows the cover open and also shows the type of lock. Figures 5 and 6 show the master controller with openings to the main

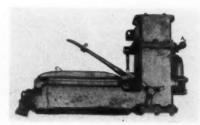


Fig. 8

spindle and reverse spindle. Figure 7 shows contactor case on locomotive with one of the two doors open for inspection. These illustrations show the great lengths that have been gone to to insure safety. The wiring and all electrical parts, such as controller case, resistance boxes, contactor case, switch box, fuse box and headlights are enclosed and are provided with locks.

The master controller on this locomotive has on the reversing drum, trolley position, reel position, and trolley position. When the reverse drum handle is on either reel position, the main spindle can be operated through the series points only.

When the reverse drum handle is on either trolley position, the main spindle is operated first through the series points and then through the parallel points. The cable pays off the motorman's end. When the reverse drum handle is placed in the left hand reel position it establishes the connection necessary to operate the locomotive from the current supplied through the cable in a direction to wind up the cable. Whenever the reverse drum handle is placed in this position the reel motor automatically starts and can not be stopped by the motorman as long as the handle remains in this position. Pushing either of the buttons which normally stop and start this motor has no effect. The object of providing this feature is to prevent the motorman from running over his cable which is not only ruinous to the cable but is likely to cause a flash which would be hazardous in a gassy or dusty mine. Whenever the reverse drum handle is in any other position the reel motor can be started and stopped by means of the push buttons.

The fuse box cover is interlocked with the main switch, both of which of course are enclosed. Unless the main switch is open, the fuse box cover can not be opened. If the fuse blows while the controller is on, the controller handle must be pushed back to zero before any current will go through the controller to the motor even though the fuse has been replaced. In other words, if a fuse blows, the motorman must throw his switch which would make the loco-

motive dead, then replace the fuse, throw his switch in again, and the controller handle back to zero, before the main motors will get any current. See Figure 8 illustrating the various features mentioned above in describing this type of locomotive. Handle "A" is switch handle. Unless handle "A" is in open position, lever "B" can not be raised and door "C" to fuse compartment can not be opened.

Battery locomotives are not as safe in a dusty or gassy mine, as they are generally supposed to be. Battery locomotives are expensive to keep up. The locomotive itself must carry a heavy load of batteries which increases the over-all dimensions of the locomotive and makes heavier rails necessary. The tendency is decidedly away from battery locomotives for gathering in dusty and gassy mines and in favor of the modern "enclosed" type of gathering reel locomotive.

Where gas and dust does not exist, and where the life of the mine justifies installing trolley wire and the bonding of rails, storage battery locomotives should not be used.

This article has been confined almost entirely to coal. In some of the metal mines, particularly copper, where the vein is not on a sufficient angle to permit the use of chutes, storage batteries have been used with great success. I have in mind one mine where chutes can not be used and where shooting in the stope brings an avalanche of rock down on the level which would completely demolish a trolley installation. This company has operated storage batteries over a period of years with great success. They have a real reason for using them, but generally speaking, unless there is some basic reason such as the above, trolley locomotives with their greater speed and lower upkeep cost will be much more satisfactory. (Figure 9.)

MOFFAT TUNNEL OPENED

Colorado officially opened the famous Moffat Tunnel with formal ceremonies on February 26.

Twenty-five hundred persons, in a special train of four sections, made the trip from Denver to the east portal of the tunnel to witness the historic event, to hear speeches commending the work of the men who made the tunnel possible, and to witness Gov. W. H. Adams, of Colorado, and former Gov. Oliver H. Shoup drive a golden spike into a tie at the eastern mouth of the tunnel.

Following the dedicatory ceremonies, the trains were formed into two sections, which steamed through the tunnel—the first passenger trains to go under the Continental Divide.

INTERNATIONAL CENTRALIZATION

(Continued from page 155)

What we may do for the protection of American industry and the maintenance of our own standard of living is our own affair, and we can not look for gratitude whether we do or do not let down our tariff walls.

CARTELS AND THE TARIFF

And that brings me back to the question of cartels: With unorganized industry in the United States and organized trusts abroad when the opportunity occurs and there is any breach in our protective tariff walls, they are coming through. That is one of the great hazards of unorganized effort. Personally, I know of an instance before the war where a certain manufacturing industry was started in this country that had never been undertaken here before. At the end of one year the American manufacturer had demonstrated ability to produce the commodity economically, and at the price of \$110 a ton it furnished a small profit. He was then visited by a representative of the foreign cartel, who said: "We want to be very friendly; we recognize the great ability with which you have mastered this industry, and we want to cooperate with you, Your price is \$110 a ton. We will allow you 20 percent of the husiness in the United States. we will take 80 percent for ourselves, and will maintain that price." The answer of the American producer was: "I will not enter into any such combination. It is unlawful. I will go it alone and you can go, alone, to a certain very warm The foreign cartel immediately dropped the price to \$60 a ton, much lower than the cost of production in the United States, and just before the war the price was dropped to \$52 a ton, because the manufacturer in this country was not only persistent but a patriotic American as well, and he also had a deep nocket.

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That is the warfare you will have to meet from the cartels. The strength of the cartel is in its unified effort; its ability to maintain prices in countries which are in the cartel, and to utilize resources thus acquired to drive competitors out of foreign markets including the markets of our own United States, which is the envy of the world.

A weakness of the cartel is also apparent: As soon as it becomes international there is the national feeling as well as the human equation—national pride, jealousy, and selfishness. I do not expect cartels in their present form to last indefinitely, but I do expect the idea to grow and superorganized aggregations to appear, and I think within a very few years we will have cartels of such sound foundation that they will be a distinct

menace to American industry. It therefore behooves us, in view of the centralization in Europe, to remember that the greatest market of the world is in the United States: that our export business is from 7 to 10 percent of the total volume of our production, and, essential as our exports appear to be, we can not afford to bring down our standard of living and throw labor out of employment here just to get us an export trade. We must not break those things down which have made our prosperity, because with wages paid here three or four or five times those paid in foreign countries, without some means to equalize this difference in cost we are in no position to defend ourselves.

I feel that the League of Nations may be useful; and on the Continent where wages are nearly on a level, where economic conditions are much the same and distances are shorter, perhaps there may be an actual breaking down of tariff walls there. Let us expect that, and let them work out their own salvation. But let us not deceive ourselves with the thought that we can make any nation grateful to us by anything we do in this country. The individual merchant decides the question of where to buy, and he will buy in the cheapest market.

So let us maintain the United States as we have it. Let us keep our present wage scale and our standard of living. Let us thus keep our prosperity. Let us continue to rationalize our industries and in many fields we shall be able to win the world's trade by giving better goods for less money; and at all times we can help Europe, because a prosperous America makes the best customer for all the nations of the world.

WORK OF SAFETY DIVISION

(Continued from page 171)

venting future explosions are reported to the mine operators, while the technical data obtained are used in publications on the prevention of mine disasters.

The bureau's engineers, on request, also investigate conditions and practices that contribute to the liability of an explosion of gas or coal dust, even though the mine has not had a disaster. A careful study is made of operating and mining methods; blasting procedure is closely observed; coal cutting, loading and haulage conditions are critically scrutinized, and in some instances explosion tests of the coal dust are made.

In the reports on these safety examinations, especial attention is given to rock-dusting, use of permissible explosives, use of closed lights, use of permissible electrical equipment, and other up-to-date safety practices. During the past fiscal year 31 formal safety reports were transmitted to operators, and numerous other underground examina-

tions were made and verbal suggestions offered.

During the past fiscal year there were also 12 papers on mine safety subjects by the Safety Division published by the Bureau of Mines or in technical papers or in the proceedings of technical or other societies.

The effectiveness of rock dust in rendering coal dust inert and thus preventing disastrous explosions in bituminous coal mines has been conclusively demonstrated by investigations and experiments of the bureau. To make the results of these extensive investigations available to the mining industry, the bureau's engineers investigate methods used in rock-dusting and the extent of application of the dust at typical mines, furnishing the mine operator with reports showing the efficiency of the treatment and containing recommendations for possible improvement.

All serious coal and metal mine fires that are brought to the attention of the bureau are investigated to obtain technical information as to the conditions under which the fires occurred and the methods employed in their extinction. The studies often involve direction of the work of building stoppings to isolate the fire area, removal of the stoppings and proper ventilation of the affected area when the fire has been extinguished, systematic sampling and analyzing of the mine air, and a determination of the probable point of origin and causes.

In the cooperative method of first-aid work so well started last year, the bureau's force trains "key men" of the mining companies in first aid, and these "key men" in turn train practically 100 percent of the mine personnel. There were over 9,000 miners trained in this manner in the last fiscal year, and it is believed that a much greater number will be trained by this method during this year.

In order to forward the safety idea in the entire mining community, the Safety Division has fostered the formation of chapters of the Holmes Safety Association in which community meetings are held with more or less formal programs. There have been about 175 chapters in 26 states formed to date, some of these organizations having several hundred members. The total membership is a little over 8,000, and it should be several hundred thousand.

When it is considered how vast is the extent of the activities of the mining industry, including coal and metal mines, quarries, and the oil industry, it is soon realized that a personnel of 83 is decidedly small to cover all of the ramifications which affect or are affected by safety in the industry; nevertheless much has been accomplished in this field, and it is believed that much will be done in the future.

REPORTS ON THE MECHANIZATION SURVEY

Four Examples Of Modified Longwall And Longface Mining—Scrapers And Conveyors In High And Low Coal-Methods Of Roof Support-Successful Roof Action By Different Caving Methods.

By G. B. SOUTHWARD

HE four reports-Nos. 325. 68, 104, and 315-show longface mining with scrapers and conveyors, using standard equipment in three of the operations and in No. 315 a specially designed conveyor combined with a coal undercutting chain. The mining systems illustrate a wide variation in the adaptation of the longface principle and range from a true advancing longwall with packed roadways to narrow pillars worked open end retreating with short faces. The seams vary from level to a 14-degree pitch and have heights of from less than 3 ft, to more than 6 ft. Several types of roof supports are illustratedtimbers, collapsible cribs, and packwalls. In some cases a high timber recovery is made, and in others all timber is lost. Varying degrees of successful roof action are had, but all have met with sufficient success to warrant the continuance of these systems by the managements using them, and these operations are of general interest in that several dis-

tinct methods of roof caving are employed.

The operation covered by report No. 325 is longwall mining in a low pitching seam with faces 300 ft. long worked advancing from a barrier pillar at the main slope. A haulway is maintained from the end of each face back through the gob with packwalls built from the top brushing taken along the roadway, and these packs are gradually compressed by the roof subsidence as the mining progresses. Along the faces the top is supported as an overhang back about 20 ft. by timbers; these are moved forward each day as the face is mined and the top caves behind the timbers with more or less frequency and regularity as the mining advances. There seems to be here a combination of roof caving behind the faces and roof subsidence along the haulway, but in the caving area it is probable that the roof falls extend above the coal for a short distance only or until the overlying strata rest on the fallen material. From this point on it is reasonable to assume that the weight of the overburden compresses both the fallen rock and the packwalls to an equal degree so that a general uniform subsidence results. This is, of course, theory, but it seems to have been well demonstrated by a successful roof action over several years of operation.

In operation No. 68 faces 200 ft. long

It is more or less agreed among mining men that longuall faces offer many advantages over room and pillar work for the use of mechan-ized equipment—particularly conveyors and scrapers-but it is not fully agreed as to what extent longwall mining can be applied successfully to the roof conditions usually en-countered. It is held by some that this application will be limited to seams with certain favoring conditions but other men are of the opinion that modifications of standard longwall can be designed to operate successfully in a large percentage of our bituminous mines. That the latter belief is rather widespread is indicated by the fact that long face operations are now being carried on in nearly every coal field in the United States and the four reports which are carried in this issue represent the States of Pennsylvania, West Virginia, Alabama States of Pennsylvania, West Virginia, Alabama and Wyoming. These operations are in high and low coal, level and pitching seams, and the methods vary from advancing longwall to short faces retreating on open and pillar re-covery. All have operated for a sufficient length of time and with a sufficient degree of success to warrant an interest in their accomplishment by the mining industry.

are worked advancing with coal pillars about 40 ft. thick left in on both sides of the haulway through the mined area back to the main slope. The roof along the faces is held on a 15-ft, overhang by timbers and is caved behind the timbers as the mining progresses. The main difference between this plan and the one described in report No. 325 is that solid pillars of coal are substituted for the packwalls along the haulway. pillars show some signs of weight as the mining progresses, but it is reported that this weight does not increase to the point of closing or endangering the haulways.

In operation No. 104 a modified longwall or a V system has been developed for scraper slabbing. At this mine scrapers were first used to recover standing room pillars, and as this operation was found to be very satisfactory the present system was adopted as having the advantage of producing a larger percentage of coal from the face mining. In this system the roof is supported on timbers in a V-shaped space between the faces but is caved in the mined area back beyond the end of the faces. Falls occur at more or less regular intervals, with the top generally breaking at or near the end of the faces, and the percentage of coal lost is reported by the management as being very low. It is probable that the overlying strata span across the V as a beam or arch supported at each

end by the solid coal along the faces and the timbers are, therefore, required to support only a few feet of roof strata immediately over the seam. This plan has not been used for a great while at this mine, but so far it has proved fairly successful, and the management does not anticipate any marked departure from the present design, although some slight modifications may perhaps be made.

The mining plan shown in operation No. 315 is a system of open-end pillar recovery designed primarily to suit a special type of mining equipment which consists of a combination conveyor and cutting machine with a cutter bar 43 ft. long. In recovering room pillars open end with this machine there would be frequent interruptions encountered in crossing each room breakthrough where the usual crosscut spacing was employed, and the plan here eliminates this source of delay by spacing the crosscuts 300 ft. or more apart and developing the panel into long narrow rectangular blocks of

coal suitable for continuous open-end recovery. In mining these blocks by the conveyor-cutter only a small working space is needed along the face, and a 6-ft, roof overhang is supported by a line of collapsible cribs with the top caving in the area behind. These cribs can be removed and reset under heavy roof weight and are moved forward 2 or 3 ft. at a time as the coal is mined, keeping always close up to the face. This continuous advance of the roof supports is a distinct advantage where the top will break in short distances, but where the roof is so strong that it will support itself for a considerable distance out beyond the line of the cribs there is apt to be excessive weight thrown on the cribs and the face. In general, however, it is reported that the roof at this mine breaks in short intervals, and moving the cribs continually as the mining progresses has proven satisfactory.

In all of these operations mine cars are placed for loading in trips. In operation No. 315 the trips are moved by a gathering locomotive, but in the other three operations a rope hoist is used. This virtually eliminates the usual gathering, and all four of these operations are taking advantage of the opportunity presented by long-face mining to concentrate the mine cars loading at one central point.

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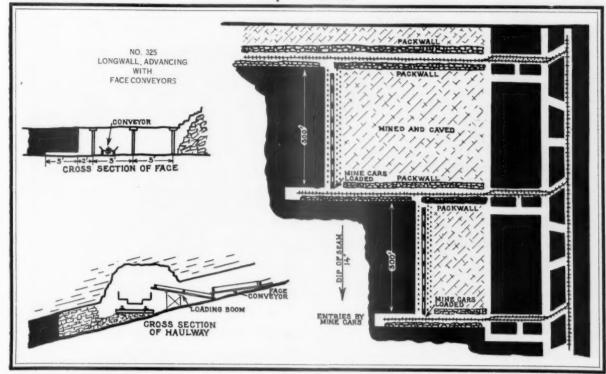
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Report No. 325



PHYSICAL CONDITIONS: The seam pitches about 14 degrees and varies from 2 to 3 ft. in height; of medium hard structure coal with no regular or persistent partings in the coal but with a soft rash parting from 4 to 6 in. thick at the bottom of the seam. Immediately over the coal there is usually a draw slate having a thickness at times of 12 in., with sandstone a few feet above. Medium hard slate bottom. Cover 300 to 600 ft. Open lights. Entries rock dusted.

MINING SYSTEM: Longwall advanc-

MINING SYSTEM: Longwall advancing with hand loading on conveyors along the faces and with the entry development by hand loading into mine cars. Faces 300 ft. long are worked advancing; these are turned parallel to the dip of the seam and the conveyor operates down the pitch to the haulway at the lower end. A single entry at the end of each face is kept advanced about 100 ft. in the solid coal to provide loading room for a trip of mine cars at the discharge of the face conveyor, and the haulway from this point to the main slope heading is maintained by packwalls back through the gob. Top is taken for height in the entries and the brushed material is used for the packwalls. Two or more adjacent faces are mined simultaneously and are stepped at intervals of 200 to 300 ft.

MECHANICAL OPERATION: Each face conveyor is a single unit 300 ft. long laid about 4 ft. from the face and is moved forward after each cut is loaded out. A row of timbers is set between the conveyor and the coal so that it is necessary to disconnect the sections to move it forward. This transports down the face to a short conveyor or loading boom which elevates the coal into mine cars. The cars are 1 ton capacity and are loaded in 7 to 10 car trips—moved by a rope hoist which hauls from a side track at the

main slope. The entry is driven slightly upgrade so that the cars will drop by gravity from the face down to the main slope sidetrack. Track of 30-lb. steel rail on 36-in. gauge is used along the haulway.

The face is machine undercut 5 ft. cutting in the rash parting at the bottom of the seam. As a high percentage of lump coal is desired, the coal is not shot down but is broken down by the hand loaders with picks and bars; the weight on the face due to the roof pressure making this hand mining possible.

TIMBERING AND ROOF ACTION: The roof is worked on the caving system along the faces but is supported by cribs and packwalls along the haulway. Round timber posts—6 to 8 in. in diameter— are set 5 ft. apart in rows parallel to the face using one row after each cut. Three rows of timbers are maintained to support the roof overhang; the first row is set 2 ft. from the face and the third row—12 ft. from the coal—is the line on which the roof breaks. After a face is loaded out and the new row of timbers is set, the last line of posts is removed—by shooting, if necessary—and the roof breaks on the next line of timbers ahead. The fall may occur soon after the posts are removed but there are times when the roof hangs for several cuts before caving. No timbers are recovered as the roof weight generally crushes the posts.

The management reports that the roof action on their longwall mining over a period of several years has been favorable with but a very small percentage of their faces lost or closed by roof falls. Faces have been mined both advancing and retreating with equally successful roof action in both methods.

OPERATING CREW: All face work is done on the day shift of 81/2 hours

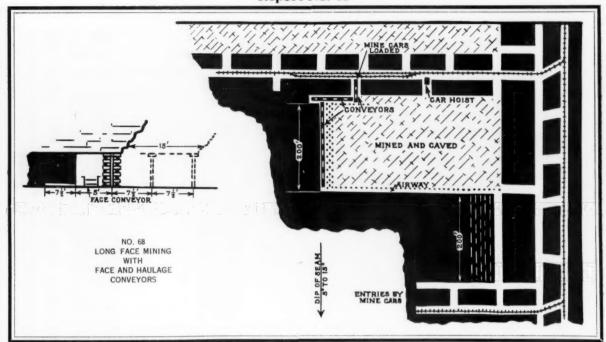
and the number of men used on a shift depends on the conditions encountered. The average number will be about 24 to complete one face cycle, but attention should be called to the fact that considerable labor is required to break down the coal by hand. These men work where directed with the cutting and timbering carried on more or less simultaneously with the loading. One face cut, producing from 100 to 200 tons of coal—depending on the thickness of the seam—is generally loaded out during a shift.

PREPARATION: The machine cuttings in the rash parting are gobbed inside the mine and any draw slate which falls with the coal is picked out to some extent while loading, but hand picking tables for the larger sizes of coal and a washing plant for the smaller sizes are used on the surface to insure a satisfactory preparation. The management reports that longwall mining produces a much higher percentage of lump coal than is had by room and pillar work.

EQUIPMENT: Each face has one sectional drag chain conveyor 300 ft. long with a loading conveyor 12 ft. long, 1 coal-cutting machine and 1 electric hoist.

CONCLUSION: Longwall conveyor mining has been in use at this operation for about seven years and all coal now being mined is from conveyor faces. The management reports this mining as satisfactory and successful in working a seam where the steep pitch and low coal would be prohibitive for hand loading in mine cars. It has been found that the concentration of mining areas increases the efficiency of supervision, decreases the percentage of accidents, eliminates ventilation difficulties, and reduces the working capital required for installation and maintenance of track, pipe and advance development yardage.

Report No. 68



PHYSICAL CONDITIONS: The seam is 6 ft. high of hard structure coal with an occasional bone parting at the bottom of the seam which at times reaches a thickness of 4 in. Sandy shale top Sandy shale top which requires some timbering in the headings. Sandstone bottom. So pitches from 5 to 15 degrees. Co 500 ft. Open lights. Rock dusting. Seam Cover

MINING SYSTEM: Long face advancing with face conveyors loaded by hand shoveling and entries driven by hand loading into mine cars. Panels about 500 ft. wide are developed by a pair of level entries which serve as a haulway and air course driven from the main slope and a panel is mined by two faces-each 200 ft. long, turned at 90 degrees to the right and left off the entries. These are worked advancing, leaving a 40-ft. barrier or chain pillar between the end of the face and the The faces are parallel to the haulway. dip of the seam which means that the conveyor on the lower side of the haulway transports coal up grade. present layout may possibly be changed to single face panels with the haulway always at the lower end of the face.

MECHANICAL OPERATION: face conveyor discharges at right angles onto a haulage conveyor which is laid back along the rib of the chain pillar next to the gob and is protected by a row of timbers set about 5 ft. from the This haulage conveyor discharges to a loading conveyor which is laid through a breakthrough leading out to the haulway and loads into a trip of mine cars placed on the side track.

The face conveyor is moved forward as a complete unit after each cut has been cleaned up. This conveyor is set close to the face of the coal before shooting and some coal falls onto the conveyor but most of it must be hand shoveled. The haulage conveyor is extended by adding sections onto the front end each day as the face advances; the discharge point remains stationary until the conveyor has been lengthened to about 200 ft., when the loading conveyor is moved ahead to the next cross cut.

The track along the haulway is laid with 20-lb, steel on 42-in, gauge and a side track is maintained at the discharge point of the cross conveyor so that the gathering locomotive will not interfere with the conveyor operation.

Mine cars of 2-ton capacity are placed in 14-car trips by a gathering locomo-tive and are moved by a rope hoist while loading in a solid trip. The rope is automatically engaged and disengaged from the cars by a small iron clip on the side of the car into which the rope drops

and is held by friction.

The coal along the faces is machine undercut 7 ft. Shots are drilled about 5 ft. apart with an electric hand drill and are fired with black powder and fuse.

TIMBERING AND ROOF ACTION: The roof is worked on the caving system and is supported as an overhang along the face by posts 8 in. in diameter set 3 ft. apart in rows. The first row is behind the conveyor and 5 ft. from the face before the coal is shot down, and as the face advances an additional row is set with each 71/2-ft. cut. After every second cut the roof reaches an overhang of 20 ft. supported on three lines of timbers and at this point the two last rows are removed and the roof breaks on the line 15 ft. ahead which has been reinforced with cribs. The management reports a 50 percent timber recovery and a roof action usually very satisfactory with little or no interruption to the face mining

At the lower end of the panel an air way is maintained from the face back to the main air course along the edge of the gob and next to the solid coal. This is supported by a row of timbers This is supported by a row of timbers set 4 ft. from the coal using 8-in. round posts spaced about 18 in. apart.

OPERATING CREW: The work is done on day and night shifts, both being

8 hours long, with the cutting, drilling

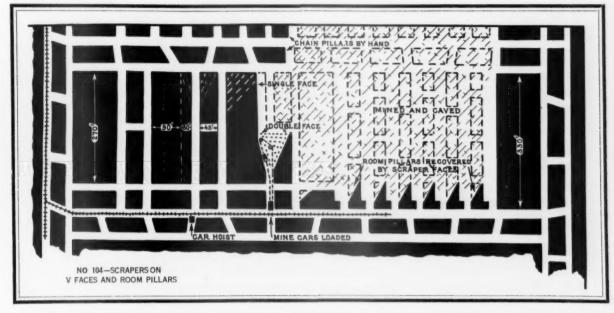
and loading on the day shift and the timbering, moving the face conveyor and extending the haulage conveyor on the night shift. The loading starts at one end of the face and as soon as a portion of the face has been cleaned up the cutting and drilling is started and follows directly behind the loading. The face is usually loaded out by the end of the shift and the cutting and drilling crew remain overtime to complete their work. The day crew has 20 men, consisting of 1 operator, who controls the conveyors and operates the rope hoist which moves the cars, 1 mechanic, 15 hand shovelers, 2 cutting machine men and 1 driller. The night crew has 10 and 1 driller. The night crew has 10 men for the timbering and conveyor work. A gathering locomotive crew of two men serve the conveyor operation. This makes a total of 32 men regularly employed for all operation on both shifts and during each 24-hour period one face cycle is usually completed, producing from 375 to 400 tons. EQUIPMENT: Each face operation

uses 1 face conveyor 200 ft. long, 1 haulage conveyor 200 ft. long and 1 loading conveyor 50 ft. long. These are all the same size and type of electric driven sectional drag chain conveyor. There is also 1 cutting machine, 1 electric hand drill and 1 gathering locomotive.

PREPARATION: The management reports that the sizes of coal obtained from the face mining compare favorably with that obtained from their hand min-Very little slate picking is done along the face and some additional labor has been required on the picking tables at the tipple.

CONCLUSION: Conveyor mining was installed by this company in 1924 and the present system has been on an operating basis since 1925. About 55 percent of the total output from this mine is now produced from conveyor faces and the management reports that this operation is satisfactorily competing with their hand mining.

Report No. 104



PHYSICAL CONDITIONS: The seam is between 4 and 5 ft. high of fairly hard structure coal with a bone strata at the top which varies from 8 to 18 in. The top is a slate which stands fairly well in the headings and along the faces. Hard fire clay and slate bottom. Seam nearly flat. Cover varies from outcrop to 700 ft. Closed lights. Entries rock dusted.

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MINING SYSTEM: The first scraper installation at this mine was used for recovering the pillars standing between rooms which had been driven by hand. These were mined by slab cuts taken diagonally across the end of the pillar on a modified open end system, but the cuts instead of being at right angles to the track were angled in toward the room neck. This system was continued for some time and as the scraper operation proved successful, the mining plan was changed from room and pillar to the present plan which was designed especially for the scraper work. Under this plan, panels 270 ft. wide and about 1,500 ft. long are developed by a haulway and two air courses, with pairs of cross entries driven through the panel width at 120-ft. intervals. This divides the coal into solid blocks 120 ft. wide and 270 ft. long with the cross entry chain pillars between. These blocks and the chain pillars are mined by long faces turned off the cross entries on an angle to form a V-shaped area in the solid coal. A pair of faces on one entry mines the chain pillar and slabs a 30-ft. width off of the 120-ft. block; this leaves a block 90 ft. wide which is worked by a single face 120 ft. long turned off of the next cross entry ahead. Only one scraper works at a time in a panel, either on a single face or on double faces; these start at the air course in the preceding panel and mine down to the present haulway before work on the next block is started. A small stump is left unmined along the haulway which is later recovered by hand loading into mine cars

MECHANICAL OPERATION: Scrapers are used along the faces and trans-port the coal from the face down through the cross entry to the haulway where it is loaded into mine cars. scraper has a capacity of about 1,200 lbs. and is moved by ropes from an electric hoist which is set at the mouth of the scraper entry along the haulway. wo types of hoists are used. One of these has three drums-two for the head and tail ropes on the scraper and the third which operates an automatic sheave to change the direction of the scraper travel when turning from the face down into the entry. The other face down into the entry. The other type hoist has two drums for the head and tail ropes and in this installation the angle of the face is such that the scraper can be moved along the face and down the entry by the direct pull from the hoist.

Mine cars are 1½-ton capacity, and are delivered in 20-car trips to the discharge point by a gathering locomotive. An electric rope hoist moves the trip while loading. Track along the haulway is laid with 30 and 40-lb. steel rail on 36-in gauge.

36-in. gauge.

The coal is cut by machine with a 6-ft. cutter bar. On account of the hard bone parting in the top of the seam, the drilling is done by a compressed air jack hammer. Shots are fired with permissible explosive and electric firing. These are spaced about 6 ft apart along the fees

6 ft. apart along the face.

TIMBERING AND ROOF ACTION:
The roof is supported on timbers in the V-shaped area between the faces and is caved in the mined area behind the end of the faces. A row of timbers is set parallel to and about 6 ft. from the face after each cut is cleaned up; these are split posts, and are placed about 4 ft. apart in each row. No timbers are recovered but are left standing until crushed by the roof weight. The roof usually breaks at or near the end of the face leaving the greater part of the face standing open, and the management reports a high coal recovery.

OPERATING CREW: The loading and timbering is done on the day shift with the cutting and drilling at night; both shifts are 8 hours long. The day crew has five men—1 face boss, 1 hand shoveler who picks down hanging coal, 1 timberman, 1 hoist operator and 1 car trimmer. The night crew has three men—2 machine cutters and 1 helper who do the cutting, drilling and the shot firing. This makes a total of 8 men on the regular face crew. In addition there is a gathering locomotive with 2 men who deliver cars but also serve other work near by. The timber and other supplies are delivered to the hoist and taken up to the faces by the regular working crews.

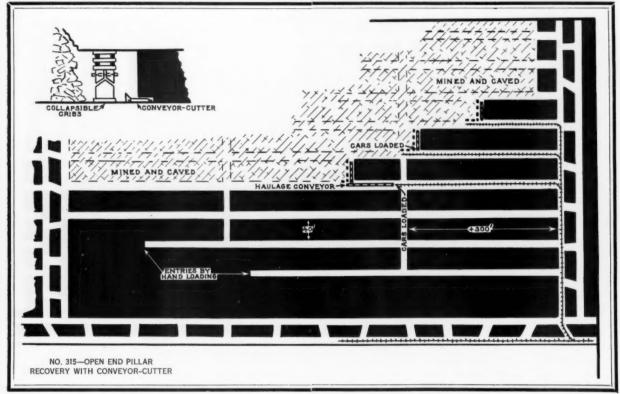
Usually a single face 120 ft. long or a pair of double faces is loaded out each day; the tonnage varies to some extent but a daily production of approximately 100 tons is reported as the average over fairly long time periods.

EQUIPMENT: Each operation uses one scraper installation complete with hoist, one cutting machine, one air driven jack hammer, one small rope hoist for moving the mine car trips.

PREPARATION: The parting which occurs above the seam is picked by hand to some extent inside the mine, but a washing plant on the surface insures clean preparation. No record has been kept comparing the amount of slate from scraper mining with hand mining and no attempt is made at this mine to prepare lump coal.

CONCLUSION: Scrapers have been used at this mine for about one year and additional units have been added since the first experimental installation. The success with which room pillars were recovered by scraper mining led to the design and adoption of their present system and while this system has not yet been entirely standardized the management reports that their scraper operations are considered satisfactory and successful.

Report No. 315



PHYSICAL CONDITIONS: The seam varies from 6 to 7 ft. of soft coal with a bone parting near the center. Fairly strong slate top which stands well in headings and breaks on cribs in the pillar recovery. Hard slate bottom. Seam fairly level. Cover up to 900 ft. Open lights.

MINING SYSTEM: Pillar retreating with conveyor loading on short open end faces and entry development by hand loading in mine cars. Panels of various dimensions—500 ft. and more in width and 1,000 ft. and more in length—are developed by a series of entries 20 ft. wide on 60-ft. centers, driven the length of the panel with cross cuts 300 to 500 ft. apart. This divides the panel into long rectangular blocks about 40 ft. wide and from 300 to 500 ft. long and these blocks are mined by open end slabbing, retreating from the panel barrier. Two or more pillars are worked at the same time with the faces stepped at 100-ft. intervals.

MECHANICAL OPERATION: A face conveyor 45 ft. long equipped with an undercutting machine chain along its entire length is used to mine the faces. This machine cuts and conveys simultaneously with the coal breaking down under the roof weight and falling on the conveyor as the cutter chain advances into the face. The conveyor transports the coal to the haulway at the end of the face where it either loads directly into mine cars or else discharges onto a haulage conveyor. When cars are loaded at the end of the face conveyor, two or more are placed at one time, depending on the clearance between the end of the face and the roof fall on the entry. Where the haulage conveyor is used, this extends from 100 to 300 ft. down the entry to a point

where a trip of 5 or more cars may be placed at one time. The cars have a capacity of 3¼ tons and a gathering locomotive serves each face operation, moving the trip past the conveyor discharge point while loading. A single track on 48-in. gauge is laid on the haulway.

way.

Very little shooting is required as the roof weight tends to break down the coal when undercut, but some pickwork is needed to loosen the coal as cutter-bar advences.

TIMBERING AND ROOF ACTION: The pillars are recovered open end, on the roof caving system. The conveyor-cutter requires a maximum clearance of about 3 ft. from the face of the coal and a row of cribs, spaced 10 ft. apart is set immediately behind the conveyor. These cribs are kept moved forward as the cutting advances, so that the roof overhang supported out from the face does not exceed 7 ft. As the face advances, the roof falls occur from time to time breaking on the line of cribs and leaving the face open. The cribs are a manufactured type, solid wood construction 3 ft. square and semi-collapsible so that they can be released, moved and reset in a very short time and under severe roof weight. This method of mining and roof support has been in use at this operation for more than two years and the management reports a high coal recovery.

OPERATING CREW: The operation is continuous and the work is carried on double shift, each shift working 9 hours. Two types of machines are used—the older type requires 3 men picking down coal along the face and the newer type requires but 2 men. In addition to these, there is, on both types of machine, 1 machine operator, 1 hand shoveler

loading bug dust, 1 gathering motorman and 1 brakeman who also acts as car trimmer at the conveyor discharge. This makes a total of either 6 or 7 men per shift as the regular operating crew—depending on the type of machine used—and under normal operating conditions a face will advance on an average of from 10 to 15 ft. per shift. Each foot of face advance produces approximately 10 tons of coal, and the record production over a 30-day continuous operation was slightly over 200 tons per shift.

EQUIPMENT: Each face operation has 1 conveyor-cutter and 1 gathering locomotive, and in one installation a haulage conveyor 300 ft. long is used along the haulage way.

PREPARATION: Very little slate picking is done inside the mine and the management reports that the quality of the coal from the face compares favorably with that obtained in hand mining. They also report that the faces produce about 20 percent more large sizes of coal than is obtained in their hand mining.

CONCLUSION: This system of mining with this type of machine has been in use at this operation for more than two years and a portion of that time has been spent in developing the operating methods, system of roof control, and perfecting the mechanical equipment. The management reports that their operation and their equipment are now considered to be on a practical and successful basis and in addition to obtaining an increased production per man at the working face, this system provides a concentration of workings that further results in indirect savings in haulage, drainage, ventilation and general mine maintenance.



Eagle Picher Lead Company Erecting Mill at Its Arizona Property

John B. Swift, president of the Eagle-Picher Lead Company, has issued a statement regarding the results of development at the company's Montana mine, at Arivaca, Ariz. The Eagle-Picher Company acquired this property, consisting of 15 claims, some time ago, and development has now reached a depth of 300 ft., with drill holes to a depth of 500 ft. It is reported that more than 100,000 tons of ore, averaging 6 percent lead, 6 percent zinc, 10 ounces silver, and \$2 gold, has been developed. Erection of a mill is in progress and it is expected that production will begin in March.

Sheldon Mining Company to Deepen Shaft

The Sheldon Mining Company, Walker, Ariz., has awarded a contract for the sinking of its present shaft to a depth of 1,250 ft. to the E. J. Longyear Company, of Minneapolis, Minn. The shaft is now 850 ft. deep. Sinking operations have been started.

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Phelps Dodge Driving Drainage Tunnel for Morenci Mines

The Phelps Dodge Corp., Morenci Branch, has contracted for the driving of a 4,300-ft. tunnel to be used for the drainage of water from the Morenci mines at Morenci, Ariz. The tunnel will be 7½ ft. high by 6 ft. wide, providing sufficiently for construction work, and it is estimated that it will take about 10 months to complete it. It is expected that the draining of the Morenci area by gravity flow will prove a considerable saving in operating costs, as at present a number of pumping stations are required.

Foundry at United Verde Completed

The new foundry erected by the United Verde Copper Company at Clarkdale, Ariz., has been completed and placed in operation. The foundry building is 80 by 120 ft. and equipment includes a steel furnace, a brass furnace, and an annealing furnace, all electrical. The foundry will make possible the utilization of a large tonnage of scrap which has accumulated.

Peru Mining Company to Construct Bulk Flotation Mill in New Mexico

The Peru Mining Company, subsidiary of the Illinois Zinc Company, has contracted for the construction of a large bulk flotation mill to be located outside of Deming. N. Mex. The initial unit will be of 100 tons daily capacity, and so designed that units may be added, raising the tonnage up to 500 tons.

The equipment of the plant includes a 2-ft. Symons crusher, a 6 x 6 Southwestern Marcy ball mill, a 4-ft. Dorr classifier, and an 8-ft. machine with a Dorrco filter and Wilfley pumps. The zinc ore will come from the Hanover and surrounding districts. Provision for selective flotation units in the mill has been made, and eventually zinc-lead ore will be milled.

Fifty-two mines of 11 companies, participating in the safety campaign sponsored by the Tri-State Zinc and Lead Ore Producers' Association, worked without a single lost-time accident the week ending February 18. The 52 mines worked a total of 19.961 man-shifts.

Exploration Work Begun at Meteor Crater in Arizona

Exploration work that will prove of exceptional interest from the scientific as well as the mining standpoint has been started by the Meteor Crater Exploration and Mining Company, of which G. M. Colvocoresses is manager. The company was organized by G. M. Colvocoresses and D. M. Barringer, of Philadelphia. The immediate problem will be to search for the main mass of the Barringer meteorite. Exploration by diamond drilling has begun, and this will be followed by the sinking of a shaft.

Barringer and associates previously drilled twenty-odd holes in the center of the crater on the theory that the meteor had fallen vertically. A more recent theory is that the mass approached the earth at an angle of 45 degrees from the north. In 1922 the U. S. Smelting, Refining and Mining Company put down a drill hole on the south rim to a depth of 1,376 feet, where it became stuck. Samples recovered contained magnetic iron oxide with nickel. Samples of

unoxidized meteoric material found in and around the rim contain over 5 percent nickel and nearly 0.3 oz. per ton of platinum and irridium.

North Lily Development Makes Progress

The new shaft at the North Lily mine, Eureka, Utah, has been sunk to a depth of 950 ft. and a station cut at that depth. Sinking will be resumed as soon as the station timbering is completed. The electric hoist from the Gemini mine of the Chief Consolidated is being moved to the North Lily to be erected at the new shaft. This will complete the equipment at the new shaft, which will be used for the development of adjoining properties as well as an operating shaft for the North Lily mine. Development results at the North Lily continue to be most encouraging.

Hammon Engineering Company Acquires Too Handy Mine

The Hammon Engineering Company of San Francisco has acquired the Too Handy Mine east of Brown's Valley, Yuba County, California. A power line has been brought to the property, buildings erected, and a hoist and compressor installed. Development work is now being pushed on the 100 level.

Death Calls E. B. Braden

Eugene Burford Braden, chairman of the advisory board of the American Smelting and Refining Company, and well known throughout the Nation as a mining expert, died recently at his home in San Francisco at the age of 63 years.

Mr. Braden's death, although due to a lingering illness, was a shock to his many friends. He had been in San Francisco since 1905 when he was sent from Montana to take charge of the American Smelting and Refining Company operations in California.

From 1905 until 1925 he was general manager and vice president of the company and at the latter date was made a member of the advisory board, later becoming chairman of that body.

Surviving him are his widow, Sara Louise, and two daughters, Mrs. Claude W. Colonna, of San Francisco, and Mrs. Henry C. Breeden, of New York.

Berrien Heads Montana Section of A. I. M. E.

At the annual meeting of the Montana section of the American Institute of Mining and Metallurgical Engineers, held at the Silver Bow Club, Butte, on February 3. Chauncey L. Berrien, general superintendent of mines for the Anaconda Copper Mining Company, was elected chairman: W. N. Rossberg, general manager of the W. A. Clark interests, was elected vice chairman; Alexander MacDonald, of the rock drill department of the Anaconda Company was reelected secretary-treasurer, and E. A. Barnard and Arthur E. Adami, members of the executive committee. Dr. F. A. Thomson, dean of the school of mines of the University of Idaho, read a paper on "The Geology of Idaho." After the technical meeting a buffet luncheon was enjoyed by a large number of members.

Anaconda Wins Patent Suit

Federal Judge George M. Bourquin, sitting at Helena, found that the Anaconda Copper Mining Company in its flotation treatment of ores has not in any way infringed upon the patents of the Metals Recovery Company and the court viewed with serious doubt the socalled Perkins patent, under which the Metals Recovery Company brought its suit, holding that the patent falls short of the statutory requirements, and even if the claims were valid there was no infringement. The Anaconda company claims that the patent was too broad and general in its claims to be a valid one, and even if the patent is valid, its provisions do not cover the reagents used by the defendant in its flotation process. The court held that "xanthate" was in use before the Perkins patent was granted or applied for.

Sullivan Zinc Plant in Operation

The Electrolytic Zinc Plant at the Star mine of the Sullivan Mining Company at Kellogg, Idaho, has been completed and placed in operation. The plant uses the Tainton Process and produces electrolytic zinc.

The Sullivan Mining Company is owned jointly by the Hecla Mining Company and the Bunker Hill and Sullivan Mining and Concentrating Company. Both of these companies will benefit from the recovery of zinc at the Star mine.

Anaconda Opens New Electrolytic Plant

Officials of the Anaconda Copper Mining Company have announced the starting of operation at the newly completed \$2,000,000 electrolytic zinc plant at Anaconda, Mont., construction on which

began early last summer. The plant was placed in operation January 22 and was expected to reach maximum activity by March 1.

By opening the new plant, output of Anaconda electric zinc in Montana will be increased approximately 50 percent. The enlarged plant at Great Falls has a capacity of 335 tons of cathode zinc a day, or 240,000,000 pounds a year. The new Anaconda plant has a capacity of 165 tons, or 120,000,000 pounds a year, making the company's total capacity 360,000,000 pounds a year.

The plant at Anaconda, like that at Great Falls, will treat ores shipped from the Coeur d'Alene and Salt Lake districts, and will also receive the bulk of zinc ores produced in the Butte area.

To Spend 20 Millions on Flin Flon Property

Contracts for construction, including ore bins, smelter, concentrator and electrolytic zinc plant, at the Flin Flon property of the Hudson Bay Mining and Smelting Company, in northern Manitoba, are expected to total around \$20,000,000.

Hydro energy will be the chief power for operating the Flin Flon mine and smelter.

Mining Institute at University of Washington Week of March 5

A mining institute open to all men interested in any branch of the mining industry will be held at the College of Mines, University of Washington, Seattle, during the week beginning March 5. Prospectors, miners, mine owners, persons interested in metallurgy, investors in mining enterprises, and the public generally are invited to attend. This institute will take the place of the Winter Mining Session, which originated at Seattle in 1897 and continued for 28 years. The complete new equipment of Mines Laboratory will be used to give demonstrations of new machines and processes in mining, ore dressing, and metallurgy. This year the ceramic industry, including cement and branches of clay working of special importance in the Northwest, will be included in the institute. All instruction will be given by specialists.

Prominent technical men and managers will give lectures on their special subjects. Among the speakers engaged are: G. T. Jackson, formerly superintendent of the Alaska-Gastineau and the Chichagof mines, who will speak on the mining of large bodies of low-grade ore; R. F. McElvenny, superintendent of the Tacoma Smelter, on the nature of contracts that a smelter can offer to mines and prospects; M. D. Leehey, mining

lawyer, on some popular errors regarding the mining law; H. H. Townsend, on the exploration and purchase of prospects by operating companies; J. L. McAllen, on quartz mining in the Willow Creek district, Alaska; F. Powell, on gold dredging. In the evenings lectures illustrated by stereopticon views and moving pictures will be given. The week will close with an excursion to mines and plants.

New Mill at National Tin's Gold Mint Property

The Gold Mint property, 2 miles east of Hill City, S. Dak., a unit of the National Tin Corporation's operation, has just completed a 10-stamp gold ore mill which will be in operation in the near future. The gold property has been under development for several months, in charge of Mr. A. L. Palmer as superintendent. The gold ore is free milling and of high grade.

In addition to the gold properties, the National Tin Corporation also owns an extensive acreage of tin properties, including the Cowboy, Mohawk, and Tin Boom claims, on which there are extensive developments of the characteristic tin deposits of the Black Hills region.

The company is planning to continue development of the tin properties in addition to the gold operation. Simon Leaderer, New York City, is president of the company.

Geophysical Prospecting

Lectures on Geophysical Prospecting by Dr. C. A. Heiland, professor of geophysics, Colorado School of Mines, and J. J. Jakosky, consulting engineer of the Radiore Company, were made February 15 and 16 at the Hotel Newhouse, Salt Lake City. The discussions were under the auspices of the Department of Mining and Metallurgical Research of the University of Utah, and the Utah Society of Engineers; and in cooperation with the Engineering Council of Utah, the Utah Chapter of the American Mining Congress, the Utah Section of the American Institute of Mining and Metallurgical Engineers, and the Mining Committee of the Chamber of Commerce.

Both Dr. Heiland and Mr. Jakosky used apparatus, slides, charts, and data to demonstrate their lectures, and drew upon the actual field tests and operations of the instruments to illustrate their points.

Of interest on this subject is also U. S. Bureau of Mines technical paper No. 420, which is just off the press and which deals with these problems in some detail.

Advocate Four-Day Week in Tri-State District

There has been considerable support given a movement to put the mines of the Tri-State district on a four-day week, in order to stem the declining zine price. Advocates of the movement contend that it will keep the employes of the district partially employed and at the same time enable the mines to dispose of the 55,000 tons of surplus ore.

Zinc Ore Exports Declined in 1927

Export of zinc ore, zinc dross, rolled zinc and imports of zinc ore decreased last year, while exports of slab zinc increased, according to a report of the Bureau of Foreign and Domestic Commerce.

Imports of zinc ore declined from 14,567 tons in 1926 to 9,513 tons in 1927.

Exports of zinc concentrates dropped from 95,252 tons in 1926 to 46,215 tons in 1927. Foreign consumers of concentrates canceled contracts they had with western zinc producers during the year, which caused this decline.

Exports of slab zinc increased from 42,835 tons in 1926 to 45,612 tons in 1927.

Exports of zinc rolled in sheets and strips dropped from 4,641 tons in 1926 to 3,922 tons in 1927, while the exports of zinc dust increased from 1,091 tons in 1926 to 1,364 tons in 1927.

Bendelari Heads Eagle-Picher Company

A. E. Bendelari, of Chicago, was elected president of the Eagle-Ficher Lead Company at a meeting of the directors in Cincinnati, February 21, to succeed John B. Swift, who has served in that capacity for seven years.

J. Edward Webb, assistant to the president, and manager of the smelter at Joplin, resigned as a member of the board of directors, and his position was filled by A. Kiefer Mayor, of Indianapolis. Mr. Webb's resignation does not presage any change in the management of the smelter.

Start Second Shaft on Paxton Property

A second shaft is being sunk on the Paxton lease of the Commerce Mining and Royalty Company. The Paxton lease is located in the sheet ground district west of Baxter Springs, Kans.

The company sank a shaft on the Paxton lease last year and has done considerable development work underground. The second shaft is being sunk several hundred feet to the south and east of the first shaft. It is supposed that the two shafts will be connected upon completion of the first shaft to the ore level.

It is thought that the Commerce company will build a mill on the Paxton property during the year, provided development work justifies the expenditure. In past years flotation has been referred to generally as "oil flotation"—today it might be more properly called "chemical flotation," states Thomas Varley, in Serial 2852, just issued by the Bureau of Mines. Minerals can be flotated today without oil. Chemicals alone will do the work, showing how little was truly known about the process heretofore. The term "reagents" as used by the bureau indicates both chemicals and oils.

During the past few years, since flotation has become the paramount treatment method for most all kinds of ores, the Bureau of Mines has gathered the data on consumption of reagents used in the flotation treatment. The first report was issued in 1916.

A brief review of such reports shows the progress made in the art of flotation, and each year brings forth the development of new reagents or combinations of reagents that seem sure to survive, but research and progress spell their defeat, if not by entire elimination, at least subjecting them to considerable modification.

The ratio of concentration in flotation is comparatively high because high-grade products are constantly being obtained more free from undesirable minerals and gangue than heretofore.

Further details are given in Serial 2852, "Consumption of Reagents Used in Flotation, 1926," copies of which may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C.

USE OF FLOTATION REAGENTS SHOWS LARGE INCREASE IN 1926

C ONSUMPTION of oils and reagents in the flotation of minerals in the United States in 1926 amounted to 201,711,795 pounds, according to the Bureau of Mines. This represents a large increase over the 1925 consumption of such reagents, which was 81,666,967 pounds. The equivalent in pounds of reagent used per ton of ore for 1926 was 3,963 as compared with 1.7952 for 1925. This increase is due largely to the amount of lime which is added in the alkaline circuits, particularly in the mills treating copper ores.

The total quantity of ore reported as being treated by flotation in 1926 was 50,889,254 tons, from which 3,353,120 tons of concentrates were obtained, giving an average concentration ratio of 15.177 tons into 1. This ratio is slightly less than that for the 1925 figure, which was 16.301 to 1. The total number of companies reporting to the Bureau of Mines was 145, whose outputs represent probably 98 or 99 percent of the total tonnage of ores treated in the United States.

Copper ores made up the great bulk of the tonnage treated by flotation, and comprised 43,967,496 tons of the total of 50,889,254 tons of all classes of ores treated. Lead-zinc-iron ores accounted for 2,457,811 tons; lead ores for 1,977,576 tons; and zinc and lead-zinc ores for 972,584 tons. Smaller tonnages treated were made up of silver-lead, gold-silver, lead-copper-silver, and miscellaneous cres.

Lime constituted the great bulk of the reagents used, amounting to 162,240,359 pounds in a total of 201,711,795 pounds of all classes of reagents. Other reagents used in large quantities were sodium sulphide, pine oil, sulphuric acid, xanthate, copper sulphate, soda ash, refined hardwood creosote, refined coal-tar creosote, and cement. Smaller quantities of water gas tar, ammonia, distillate, coal tar, sodium silicate, cresylic acid, crude oils, T & T mixture, zinc sulphate, cyanide, N. T. U. oil, sodium carbonate, reconstructed oils, thiocarbanilid, sodium sulphite, A. T., X-Y mixture, and orthotoluidine were used.

Golden Rod Mng. & Smelting and Evans Lead Companies Consolidate

Consolidation and reorganization of the Golden Rod Mining and Smelting Company and the Evans Lead Company of Charleston, W. Va., under the name of the Evans-Wallower Lead Company, were completed February 22, Edgar Z. Wallower, president of the new concern, announced.

A consolidated balance of the two companies shows total assets of close to \$4,000,000. "The new company," according to Mr. Wallower, "will be in a strong financial condition from the outset, having current assets of approximately \$935,361, as against current liabilities of \$141,842, with no bonds or fixed obligations outstanding."

The Golden Rod Mining and Smelting Company is one of the oldest and largest zinc and lead mining concerns of the Tri-State district. Last year the Golden Rod was the third largest producer of zinc and the second largest producer of lead in the Joplin field.

The Evans Lead Company's plant is at Charleston, W. Va. The principal products of the Evans Company are

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also aper and ome litharge, a monoxide of lead and red lead. The finished products enter into the manufacture of lead cell batteries, which perhaps is the most important outlet. Its products also are used by the manufacturers of paints, enamels, enamel ware, oil refining, linoleum, colors, rubber and tile.

Officers of the new company will be: Edgar Z. Wallower, Joplin, president; F. C. Wallower, Joplin, vice president; Ray Evans, Charleston, vice president; H. H. Wallower, Leadville, Colo., vice president; W. H. Rowley, Charleston, vice president; H. C. Mills, Joplin, secretary; and Louis M. Atha, Charleston, treasurer.

Missouri Mineral Output, \$34,011,881

Missouri's mines produced 293,300 tons of lead, 35,101 tons of zinc, 2,500,000 tons of coal, 1,123,972 tons of clay, and 250,000 tons of shale in 1927, valued at \$34,011,881, according to a report compiled by Frank Fenix, state mine inspector. In 1926 mines produced 303,816 tons of lead, 44,598 tons of zinc, 2,849,884 tons of coal and 1,037,015 tons of clay, with a combined value of \$43,915,469.

"The principal mining industries of Missouri have had a very good year, considering the unfavorable market conditions of the lead and zinc industry, the national coal strike, which lasted six months, and the very unfavorable weather conditions prevailing in the first half of the year," Inspector Fenix stated.

According to the estimates on production for 1927, compiled by the Missouri Bureau of Mines, under the direction of Inspector Fenix, the mines in the southeastern lead district fell 9,500 tons short of the 1926 output. At the same time the southeastern district produced 8,500 tons of zinc concentrates, as against 1,241 tons in 1926, a gain of more than 7,000 tons for 1927. In the Joplin district the production of lead fell 1,200 tons, and that of zinc nearly 17,000 tons under the output of 1926. The 1927 output of lead from the Joplin district was 2,200 tons and of zinc 26,551 tons.

While the difference in tons produced is small, the difference in value is quite pronounced, the total value of zinc and lead produced in 1927 being estimated at \$23,401,540, as against \$32,976,633 in 1926, a difference of more than \$9,000,000. The average price paid for lead in 1927 was only \$75 a ton, as compared with \$101 in 1926, while the average price received for zinc was \$40, or almost \$10 a ton less than was received in 1926.

While a large majority of the large union coal mines of the state remained inactive for a period of six months, the coal production for 1927 will show only a slight loss in production, as compared

with the previous year. This is due to the opening up of more than 100 small mines, especially in the central and northwestern portions of the state, and the breaking away from the union control of the United Mine Workers of several of the large mines.

Differential Flotation of Complex Sulphide Ores

The differential separation of complex lead-zinc-iron ores has been brought to a very high degree of efficiency and at the present time there are several plants which are making very clean-cut separations of copper and lead in complex copper-lead-iron ores, according to the Bureau of Mines. One of these, which has been in operation for nearly two years, is a mill at Bingham Canyon, Utah.

Another mill treating a moderate tonnage of ore is using a three-separation process on a complex silver-lead-zinccopper-iron ore. From the crude ore they are making a desirable silver-lead product, a high-grade zinc product and a desirable copper product. Such operations as these tend to show the value of research work and its application to commercial practice, thus making profitable commercial products from the various complex mineral constituents in these complex ores.

Idaho Hermit Mines, Inc.

The Idaho Hermit Mines, Inc., operating in Bayhorse district, Custer County, Idaho, has purchased the Daisy Homestake gold mines in the Neal district, Elmore County, Idaho, from the Duffy interests, of Rochester, N. Y. This property was at one time extensively operated by the Balbec interests. The Idaho Hermit company will resume operations on its properties adjoining the Livingston mine in Custer County in the spring. Kirby Thomas is president of the company.

Plaque Framed in Idaho Ore to Have Place in Washington Monument

Idaho, the last state to have a representative stone in the Washington Monument, at Washington, D. C., is to have a plaque to be framed in Bunker Hill galena ore, according to reports received at Spokane.

A block of Idaho stone to be furnished by the Boise Stone Company has been selected by Governor H. C. Baldridge, and Manager Stanly A. Easton, of the Bunker Hill & Sullivan mine, has selected and shipped to Washington the sparkling silver trimming which is to surround the plaque as a frame. The plaque is to be given a prominent place in the winding stairway of the great monument.

Personal Items

H. C. Carlisle, consulting mining engineer of San Francisco, recently visited British Columbia on professional work.

E. G. Dean, formerly manager of the Superior and Boston Copper Company, Globe, Ariz., is at Clearwater, Fla.

Dr. L. D. Ricketts has resigned from the presidency of the Ahumada Lead Company and its subsidiary, the Erupcion Mining Company.

Louis A. Wright, consulting engineer, of San Mateo, Calif., has returned from South America.

Percy W. Donovan, manager for the E. J. Longyear Company, of Minneapolis, recently visited Ajo and Kingman, Ariz., on company business.

Oliver C. Ralston, metallurgist at the Berkeley station of the U. S. Bureau of Mines, has resigned to accept a position with the United Verde Copper Company at Clarkdale, Ariz.

George W. Starr, managing director of the Empire mines, Grass Valley, Calif., has gone to Johannesburg, South Africa, to revisit mining districts in which he was at one time employed.

Arthur Notman, consulting mining engineer, of New York, was recently in the Southwest on professional business.

W. G. Pearsall, mining geologist, of Duluth, Minn., recently returned from a trip to Seattle, Wash.

Philip F. Beaudin, general manager for the East Butte Copper Company, Butte, Mont, has been elected as vice president to succeed the late James H. Reed, of Pittsburgh.

Philip D. Wilson, formerly geologist for the Calumet & Arizona Mining Company, sailed January 7 for Maderia, where he will take a steamer for Cape Town.

R. L. Andrew, of Los Angeles, has been appointed general manager of the Yellow Pine Mining Company, Goldsprings, Nev., to succeed Frank J. Wiebelt, resigned.

H. C. Henrie, Copper Queen Branch, Phelps Dodge Corp., has left for Cuba, where he will do consulting work for the American Metals Company on safety and labor problems.

Douglas W. Jessup, assistant superintendent of the Midvale plant of the United States Smelting, Refining & Mining Company, has resigned in order to accept a position with the Anglo-American Corporation at Broken Hills, North Rhodesia, South Africa, as assistant manager of their electrolytic zinc plant.

E. M. Norris, formerly assistant superintendent of the Boston and Montana mines of the Anaconda Copper Mining Company, has taken charge of the company's phosphate property at Conda, Idaho, succeeding C. E. Nigham, who has taken charge of the Anaconda coal mines in Poland. Mr. Norris is succeeded in Butte by H. J. Rahilly, formerly assistant general superintendent of the Original and Steward mines.

Hydraulic Classification of Metal Feeds

A new type of hydraulic classifier, devised by the Bureau of Mines, and which is being used with success in the mills of the Coeur d'Alene mining district in Idaho and elsewhere, is described in Technical Paper 403, by A. W. Fahrenwald, just issued by the bureau. Results obtained with the classifier show that proper classification of sands increases the recovery of valuable minerals by tabling, improves the grade of the concentrate, and increases the capacity of the tables. This investigation of the subject of hydraulic classification was conducted in cooperation with the School of Mines of the University of Idaho.

The primary objects of the work were to increase efficiency in the concentration of ores on tables and to determine whether classification of the ore pulp by hindered settling would be of benefit in connection with tabling. Consequently, the work involved a careful study of the fundamental principles of hydraulic classification, the practical requirements of hindered settling, and the development of a suitable classifier.

Copies of Bureau of Mines Technical Paper 403, "Hydraulic Classification; Its Theory, Mechanical Development, and Application to Ore Dressing," may be obtained from the Government Printing Office, Washington, at a price of 15 cents.

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Third Government Test Strikes Substantial Bodies of Potash

The thickest bodies of potash salts yet revealed by Government tests have been found in the third Government weil drilled in Eddy County, New Mexico, according to a statement made public by the Interior Department. The Geological Survey has recently completed analyses of samples selected from the core of this well which show that within 1,500 feet of the surface nine beds or groups of beds of possible commercial interest were encountered. One of these, at a depth of about 1.466 feet, is 8 feet 10 inches thick and contains 11.08 percent of potash (K2O) in the sample as received, equivalent to 18.25 percent K2O in the soluble salts. Other noteworthy beds range in thickness down to 2 feet 3 inches and in potash content from 8.50 to 13.68 percent in the samples as received. Only one potash mineral, polyhalite, was recognized in the samples recovered in drilling, but owing to difficulties experienced in this connection some of the more soluble salts originally present may have been lost. The polyhalite occurred in a number of colors and textures, including a coarsely crystalline variety new in this country.

Well No. 3 is about 28 miles from Carlsbad, N. Mex. It is one of the group being drilled by the Bureau of Mines under the potash act, which provides for joint exploration by the Geological Survey and the Bureau of Mines.

The samples analyzed came from depths ranging from 365 to 1,475 feet.

Mining Problems of Red Iron Ore District, Alabama

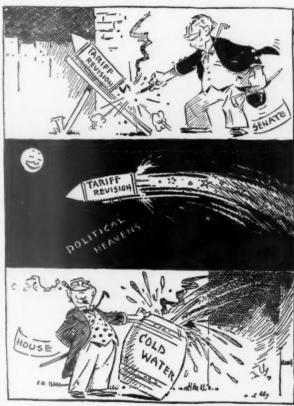
Modifications of current mining practice and certain radical changes in virtually all methods of working the red iron ore mines of the Birmingham district, Alabama, probably will be required, the Bureau of Mines points out following a study of the development, mining, and handling of ore in folded and faulted areas in this district. These changes will be necessary because of the increasing depth of cover and the necessity of more adequate support.

A report recently issued by the bureau, deals specifically with the development and handling of ore as affected by folds and faults in the ore bed, and considers changes that may be desirable or necessary in future mining practice.

Copies of this report, Bureau of Mines Technical Paper 407, "Development, Mining, and Handling of Ore in Folded and Faulted Areas, Red Iron Ore Mines, Birmingham District, Alagama," by Dr. W. R. Crane, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 15 cents.



Kansas City Star



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CLOSER AFFILIATION BETWEEN THE OPERATING AND MANUFACTURING BRANCHES OF THE MINING INDUSTRY

By E. A. WILLIFORD *

T is sometimes a difficult matter to decide in just what way a manufacturer may best serve an industry. The uses to which the manufacturer's product is put and the buying habits of the industry are often but half understood. In order for the mining industry to secure the utmost of assistance from manufacturers of mining equipment and supplies, it is necessary that there be closer understanding of each other's problems on the part of these two groups.

May I take the carbon brush industry as an example? Our own problems are well understood by ourselves but, unfortunately, they do not seem to be well understood by the industries who buy our products. The carbon brush industry has been something like Topsy, of Uncle Tom's Cabin fame, in that it has just grown. As the art of machine design progressed, new grades of carbon brushes have been called for and no restrictions have been placed upon the designing engineer in the determination of sizes, shapes, and styles of brushes to be used on this new equipment.

Of course, it is possible to make brushes to practically any specifications required, but to do so requires the development of new tools, and the more of these styles that are called for the less possibility there is of manufacturing in sufficient quantities to keep manufacturing costs down where the brush manufacturer would like to have them.

This has resulted in your electrical equipment being supplied with many sizes and styles of brushes where perhaps a small fraction of this number would do the job satisfactorily, and here is where the mining industry becomes interested in the carbon-brush problem.

Because of the fact that there are so many types of brushes in use in a given mining property, there is very little tendency to stock these items in the storeroom, but they must be ordered just as needed, made up specially by the brush manufacturer after receipt of the order, and the mining industry pays for this situation both in the cost of their brushes and the delay in shipment of the goods. It is possible that a survey made by experts could reduce very materially the number of sizes required for the equipment in any mining property, enabling this property to set up a stores control and purchase carbon brushes in sufficient

quantities to save from 10 to 50 percent of the price they must pay when purchasing in smaller quantities.

Although the carbon brush purchases may not run into any very large figure in a year's time, it is a matter which comes up for purchase at very frequent intervals and represents one of the items wherein the mining industry might well profit by cooperation with the manufacturers of these supplies. This happens to be the one item with which I am most familiar, but there are many other places in the mining industry where economies can be effected by a cooperative study on the part of the operators and the equipment manufacturers.

Oil Production in 1927 Shows Increase

World production of petroleum during 1927 totaled 1,254,000,000 bbls., of 42 U. S. gals., an increase of 156,000,000

bbls., or 14 percent over 1926, according to a preliminary Department of Commerce estimate prepared by John H. Nelson, Bureau of Foreign and Domestic Commerce, and E. B. Swanson, Bureau of Mines.

The United States continues to produce more than 70 percent of the world total, increasing from 770,874,000 bbls. in 1926 to an estimated total of 905,800,-000 bbls. in 1927. The decrease of 26,-000,000 bbls. in Mexican production dropped that country from the second place position among oil producing countries which it has held for the past nine years. Mexican production decreased from 6,000,000 bbls. in January to approximately 4,500,000 bbls. in December. Shipments of Mexican petroleum during 1927 are estimated at 48,700,000 bbls. Russia moved into second place again for the first time since 1917. Venezuela was third in production by a slight margin over Mexico. Venezuelan production increased from 4,858,000 bbls, in January to 7,305,000 bbls. in December. The largest percentage increase was noted in Colombia, where production increased from 6,444,000 bbls. in 1926 to 14,600,000 bbls. in 1927, raising Colombia from eleventh to eighth place.

INTERNATIONAL FIRST-AID AND MINE-RESCUE CONTEST TO BE HELD AT BUTTE, IN AUGUST

THE seventh International First-Aid and Mine-Rescue Contest, sponsored by the United States Bureau of Mines, will be held this year at Butte, Mont., August 20, 21 and 22. The dates and place for the holding of this annual outstanding mine-safety event have been approved by the Secretary of Commerce following an invitation given by a number of business and engineering organizations of Butte and by leading mining companies operating in that district.

The International First-Aid and Mine-Rescue Contests are held each year under the auspices of the Bureau of Mines, with the cooperation of the National Safety Council, The American Red Cross, and various mine operators' associations and miners' organizations. Expert first-aid and mine-rescue teams from all of the important mining districts of the country compete at these events for a large number of prizes and trophies donated by different mining or safety organizations. Each first-aid team is required to perform certain definite problems in first-aid practice, calling for the treatment of injuries and proper handling of the patient. The mine-rescue teams, provided with oxygen breathing apparatus and other necessary equipment used by rescue crews in coal and metal mines, work out practical problems such as are likely to be encountered in underground rescue and fire-fighting operations.

Employes of coal and metal mines, quarries and metallurgical plants and workers in the oil and gas industries are eligible to participate in the contest. More than 200,000 workers in the different mineral industries have been trained in first-aid or mine-rescue methods by the Bureau of Mines, 39,200 having been so trained in the past fiscal year.

Butte, Mont., designated as the place for holding the seventh of these important mine-safety events, is the greatest metal-mining center in the world. The mining industry of that district has taken a prominent part in all previous international contests, the Anselmo team, of the Anaconda Copper Mining Company, having won first place in the contest conducted at Pittsburgh, Pa., in 1927.

The following named organizations or companies issued a joint invitation to hold the contest at Butte: Butte Chamber of Commerce; Butte Rotary Club; Butte Kiwanis Club; Montana Society of Engineers; Montana section of American Institute of Mining and Metallurgi-

^{*} Manager, Carbon Sales Division, National Carbon Co., Inc.

cal Engineers; Butte Exchange Club; Montana State Metal Trades Association; The Butte local union of the International Union of Mine, Mill and Smelter Workers; Anaconda Copper Mining Company; Elm Orlu Mining Company; Butte & Superior Mining Company, and the East Butte Copper Mining Company.

Rock-Dusting in Pennsylvania Mines

Two hundred mines of Pennsylvania have been rock-dusted as a means of preventing coal mine explosions, according to Secretary of Mines Walter H. Glasgow.

The Department of Mines is taking steps to assure the practice of using rock dust is followed as widely as possible. A statement by the department sets forth that it is convinced that spreading of the rock dust over the surface of the combustible material reduces the hazard of explosion, imminent at all times in some mines. Secretary Glasgow has urged all operators to remove as much combustible material. as possible and then to use plenty of rock dust at all danger points.

Iowa-Missouri Operators and Miners Sign Contract

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More than 2,000 miners of Appanoose County, Iowa, and the vicinity of Lexington, Mo., have joined an organization to be known as the Southwest Miners' Association of America, the result of an amalgation of the United Brotherhood of Miners of southern Iowa, and the Independent Miners of Lexington, Mo.

Recently a committee of miners met with a committee from the Southwest Coal Operators' Association and signed a wage scale to replace the scale which will expire April 1. The old scale carried a basic rate of \$5 a day. The new contract calls for raises, the most noticeable of which was a raise from 18 to 22 cents per ton for machine runners. Different classes of day labor were increased from \$5.15 and \$5.41 to \$6 and \$6.50.

The new miners' union is headed by James Agnessen of Centerville, Iowa, and Arch Helm of Lexington, Mo. Helm was formerly state president of the United Mine Workers of America.

A prize of "\$5,000 for the best contrivance for neutralizing the pernicious effects of dust in mines," has been offered by the Prussian Ministry of Commerce and Trade. The prize will be donated either in full or split up into parts in the event of several acceptable devices being submitted, according to a Berlin cable.

I. C. C. DISALLOWS REDUCTION IN LAKE COAL RATES FROM SOUTHERN FIELDS

The Interstate Commerce Commission has refused to allow the principal railroads serving southern West Virginia, Virginia, eastern Kentucky and Tennessee to reduce rates on coal to Great Lakes ports by 20 cents a ton, as proposed by those roads last July following the decision of the commission in May of last year which made a cut of 20 cents from mines in the Pittsburgh and Ohio districts. The decision was made public February 25 and is an important victory for the northern operators, as the rate relationship will determine in large part the domination in the lake cargo trade, which amounts to approximately 30,000,000 tons of coal a year.

The proposed reduced schedules were filed by the Baltimore & Ohio, Chesapeake & Ohio, Louisville & Nashville, and the Norfolk & Western lines last summer, only to be suspended by the commission. In the six months following the reduced rates were the subject of extended investigations, hearings and arguments before the commission.

In its latest decision the commission indicates a flat refusal to change the position that it took in ordering the northern rate cut last May.

"All of the rates under consideration, and the rates from the Pittsburgh and Ohio fields, as well, were initiated, modified, established or adjusted by us in an endeavor to provide as nearly as may be such a system of rates would enable the carriers in the groups in which they were placed to earn the aggregate annual railway net operating incomes based upon property values which the law requires us to endeavor to secure," the decision said.

"In so adjusting these rates as the law requires, we gave due consideration to the transportation needs of the country and the necessity of providing the people of the United States with adequate transportation * * * the reductions we required from the Pittsburgh and Ohio fields were made in the

exercise of our power to modify particular rates found to be unjust and unreasonable.

"The proposed reduction before us would create no new traffic. If the prophecies of the southern railroads are correct, the only effect would be a diversion of a portion of the tonnage from one set of carriers to another within the same rate group. We find that the proposed rates have not been justified. We shall require the cancellation of the suspended schedules and discontinue this proceeding."

DECISION CRITICIZED

Some sharp strictures on the decision were made by Senators from the West Virginia-Kentucky coal districts, southern coal operators and state officials.

James D. Francis, chairman of the southern operators' committee in the rate dispute, said at Huntington, W. Va., that "it seems to us that in rendering this decision the commission has gone beyond the authority given it by Congress. They are taking away from the railroads their authority to initiate their own rates within a zone of resonableness."

Louis S. Epes, of the Virginia Corporation Commission, declared that "the natural benefits resulting to one people from cheap cost of production should not be transferred from them to others by increased arbitrary differentials in freight rates."

It was hinted in other quarters that Federal court action might be the next step in the controversy.

The decision will mean more than \$1,000,000 a week gain in the Pittsburgh field's coal business, according to Thomas A. Dunn, chairman of the general traffic committee of the Pittsburgh Chamber of Commerce, who directed this district's fight in the lake cargo case.

Dunn also said the commission's action would undoubtedly result in a revival in other lines of trade.

In 1927, 95,459,840 net tons of coal were consumed by Class I railroads in the United States, as against 101,155,412 tons in 1926. The average cost per ton was \$2.66 in 1927, as against \$2.63 in 1926. The total cost was \$253,542,835 in 1927, as against \$266,527,252 in 1926.

In 1927, gallons of fuel oil consumed totaled 2,042,137,055, as against 2,064,-500,770 in 1926. The average cost per gallon was 2.81 cents in 1927 and 2.95 cents in 1926. The total cost was \$57,-326,689 in 1927, as against \$60,938,230 in 1926.

Codes for the prevention of dust explosions in terminal grain elevators and flour and feed mills have just been adopted as American standards by the American Engineering Standards Committee. The preparation of the codes was sponsored by the United States Department of Agriculture and the National Fire Protection Association, which worked with a sectional committee of the American Engineering Standards Committee.

Standards were recently adopted also for pulverized fuel systems.



A group of spectators at the 1,000th test in the Experimental Mine, including a number of Bureau of Mines officials and two state mine inspectors.

COAL DUST EXPLOSION TEST NO. 1,000 STAGED AT EXPERIMENTAL MINE

COAL-DUST explosion test No. 1,000 was staged at the Experimental Mine of the United States Bureau of Mines, at Bruceton, Pa., Monday, February 6. A representative group of state mine inspectors, mining officials, and mining engineers were present to witness the spectacular event. The Experimental Mine, located within a few miles of Pittsburgh, is the only coal mine in the world owned and operated by a governmental agency for the sole purpose of conducting mine-safety tests. The mine has been used for this purpose during a period of more than 16 years.

The opening of the Experimental Mine, and in fact the establishment of the Bureau of Mines, was brought about as the result of a series of disastrous coal-mine explosions which occurred in the United States in the year 1907.

The bureau, although not the first organization to study the causes and prevention of mine explosions, was the first to conduct its investigations in a coal mine. An intensive search, conducted by George S. Rice, chief mining engineer of the bureau, ended in the selection of a site for the mine about 13 miles south of Pittsburgh. Nearly a year of construction work was required before any tests could be made.

On October 24, 1911, the first explosion test was conducted in the Experimental Mine, demonstrating beyond doubt that bituminous coal dust raised as a cloud in air was explosive when ignited and that it was not necessary that firedamp be present to cause the dust to explode. Then followed a series of public demonstrations which proved the extreme danger of coal-dust accumulations, regardless of the presence of firedamp. The long search for methods of combating the hazard was next undertaken.

Sir William E. Garforth, a distinguished British mining engineer, proposed the spreading of a non-combustible dust like rock dust, through the mine as a means of preventing and limiting the explosion of the coal dust. Rock dust, when tested in the Experimental Mine, was found to be more effection.



Instruments in the observatory at the mine which record the physical phenomena of an explosion.

tive than any other agency for allaying the danger of coal dust, and hundreds of explosion tests have determined how much rock dust is needed for more than 30 different kinds of coal.

While test No. 1,000 is a unique achievement in the continuous testing of the explosibility of coal dust, the work will progress as long as information of real value to the mining industry can be obtained.

Alabama Council, Holmes Safety Ass'n

At a recent meeting of the Alabama council of the Joseph A. Holmes Safety Association new officials were elected as follows: Milton E. Fies, president; F. R. Wall, vice president, and H. E. Mills, secretary. Members of the advisory board were also named and included Harold McDermott, L. E. Geohegan, Charles F. DeBardeleben, Frank Morris, A. B. Aldridge, George F. Peter, and Erskine Ramsay. The council has a large number of chapters in the coal mining camps of Alabama, and through the efforts of these various units accidents have been materially reduced.

C. H. Jenkins Heads Fairmont Coal Operators' Association

The first annual meeting of the Fairmont Coal Operators' Association was held in Fairmont, W. Va., February 14. The following officers and directors were elected to serve during the ensuing year:

Officers—Fresident, C. H. Jenkins, vice president, Hutchinson Coal Company; vice president, A. Lisle White, general superintendent, Virginia-Maryland Coal Corporation; treasurer, J. A. Clark, Jr., general superintendent, Clark Coal & Coke Company; secretary, T. N. Moran.

Directors-C. H. Jenkins, vice president, Hutchinson Coal Company; A. Lisle White, general superintendent, Virginia-Maryland Coal Corporation; W. J. Mc-Bride, secretary, Century Coal Company; Thos. R. Craig, general manager, Wolf Summit Coal Company; J. A. Clark, Jr., general superintendent, Clark Coal & Coke Company; R. M. Hite, president, Virginia & Pittsburgh Coal & Coke Company; A. W. Hawley, of the Greer Gas Coal Company; Geo. R. Marrs, general superintendent, Valley Coal Company; John F. Phillips, president, Delmar Coal Company; H. W. Showalter, president, Continental Coal Company; and C. J. Ryan, general superintendent, Hutchinson Coal Company.

B. M. Clark Heads Central Pennsylvania Operators

The Annual Meeting of the Central Pennsylvania Coal Froducers' Association was held on February 14 at Altoona, Pa. It was well attended and an exceptionally comprehensive and well-prepared report was presented by Charles O'Neill, secretary-treasurer of the organization. There was general discussion of the legislative situation in the National Capital, with particular reference to the movement to do away with the injunctive power of the courts and also concerning the investigation of the industry in western and central Pennsylvania, Ohio and West Virginia that is provided for by the Johnson resolution. Secretary O'Neill's report covered the Association's activities and the situation in the district. A. M. Liveright, of Clearfield, general counsel of the Association, reported on the legal phases of traffic and other cases, and Executive Secretary Gandy, of the National Coal Association, sketched the legislative situation at Washington. The following officers were elected:

President, B. M. Clark, president, Rochester & Pittsburgh Coal Company, at Indiana, Pa.; vice president, C. Webb Shillingford, president, Empire Coal Mining Company, New York City; and secretary-treasurer, Charles O'Neill, of Altoona, Pa. ir-

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Mergers Under Way Will Control 13 Percent of Annual Coal Output

Three gigantic mergers in the coal industry, controlling approximately 13 percent of the nation's annual production of soft coal, are reported to be developing, with tentative proposals and agreements indicating that it will be only a matter of a few months before negotiations are completed. Two of these are projected in West Virginia, one in the northern and the other the southern part of the state, and the third in Kentucky.

Isaac T. Mann, president of the Pocahontas Fuel Co. of Pocahontas, Va., is chairman of a committee which is directing the consolidation of properties in the southern West Virginia field controlled by about 30 companies, with an annual production of about 30,000,000 tons. Engineers and accountants have been at work since early in February on valuing the properties. The companies in this group will include, it is said, the Massachusetts Gas Co., American Coal Co., Gulf Smokeless Coal Co., Pond Creek Pocahontas Co., Berwind-White Coal Mining Co., General Coal Co., Slab Fork Coal Co., and the Crozer Pocahontas Coal Co.

V. L. Highland, of Clarksburg, W. Va., is chairman of the executive committee working out plans for the consolidation in the northern part of the state of operators having an annual output of around 25,000,000. Companies Included in this transaction are the Pursglove Mining Co., Clark Coal & Coke Co., Delmar Coal Co., Bertha Consumers Co., Consolidation Coal Co., and the Hire interests of Morgantown, W. Va.

The Kentucky merger involves about 26 mines in the No. 4 seam of the Hazard field, and is said to include virtually every company mining the Hazard No. 4 seam, with a production of more than 7,000,000 tons annually. The operating committee is headed by John P. Gorman, of Lexington. At a meeting of the coal operators in Lexington the middle of February, 90 percent of them agreed to finance the appraisal of their own properties. Among the companies are the following: The John P. Gorman Coal Co., C. L. Ryley Coal Co., Consolidated Fuel Co., Columbus Mining Co., Rockhouse Coal Co., Carr's Ford Coal Co., Meems Haskins Coal Co., Blue Jackett Coal Co., and the Indian Head Coal Co.

It is expected that similar consolidations will be negotiated in other coal fields if the pending mergers are successfully concluded. Such steps may be taken in the Ohio No. 8 field, the Clearfield field of Western Pennsylvania and the Harlan field of Kentucky, it is said.



The coal car shown above is one of eleven that have been recovered from the No. 12 Mine of the Consolidation Coal Company, near Frostburg, Md., after having been buried some 35 or 40 years. According to W. C. Snyder, general superintendent of the Consolidation's Maryland properties, it seems that there was a fire in the south portion of the mine, and in order to extinguish the fire, this portion was flooded. In pursuing their reclaiming scheme, these cars were uncovered recently, and this one brought out as a curiosity. The coal, although loaded 35 or 40 years ago, was in good condition, with the exception of discoloration.

Indiana Fuel Conference

Under the direction of the Engineering Extension Department of Purdue University, a conference will be held on April 5 and 6, to be known as the Indiana Fuel Conference. It is intended to have the meeting be of interest to producers and distributors. The tentative program follows:

Thursday, April 5—Registration, Mechanical Engineering Building; Inspection trip.

1.30 p. m.—Address of welcome; fuel resources of Indiana; fuel and power as affecting progress; fuel research problems; general discussion.

6.30 p. m.-Informal dinner.

Friday, April 6, 8.30 a. m.—Symposium, burning Indiana coal: (a) Commercially; (b) Domestically. How many engineers, producers and consumers cooperate? Coal storage.

1.30 p. m.—Smoke elimination; coal marketing. (a) Fitting the coal to the plant. (b) Standardizing marketing methods.

Because of a confliction with the date of the American Mining Congress meeting in Cincinnati, the annual meeting of the Mine Inspectors Institute of America to be held at Lexington, Ky., has been changed to May 1-3. C. A. McDowell, Box 64, Pittsburgh, Pa., is secretary.

Indiana Operators and Miners Fail to Agree on Wage Scale

Standing firm in their views for and against retention of the present wage scale, operators and miners of the Indiana bituminous coal field were unable to reach an agreement at a conference held at Terre Haute, February 23 and 24.

A suggestion that the International Joint Policy Committee be called together by President John L. Lewis was met by a statement from operators that this action would be useless unless a lower wage scale would be offered.

Harvey Cartwright, president of district No. 11, stated that he did not believe the International Policy Committee would agree to any wage reduction.

As the situation stands there will be a complete shutdown of the mines in the Indiana field on April 1.

Ezra Van Horn Again Heads Ohio Coal Operators' Association

At the annual meeting of the Eastern Ohio Coal Operators' Association, held at the Hotel Cleveland, Cleveland, Ohio, on February 13, Ezra Van Horn, vice president of the Clarkson Coal Mining Company, was honored by reelection to the presidency of the organization. This will make the fifth consecutive term for Mr. Van Horn. Other officers elected for the ensuing year were:

Vice president, W. L. Robison, vice president of the Youghiogheny & Ohio Coal Company; treasurer, H. R. Sullivan, treasurer of the Central Coal Mining Company; and secretary, D. F. Hurd. The Executive Committee is as follows: Alva Bradley, president, United States Coal Company; A. W. Dean, secretary, Barton Coal Company; R. L. Ireland, Jr., general manager, W. & L. E. Coal Mining Company; T. K. Maher, president, Rosemary Coal Company; J. C. Nelms, general manager, Ohio & Pennsylvania Coal Company; Samuel Pursglove, president, Big Five Coal Company; S. H. Robbins, president, Youghiogheny & Ohio Coal Company; W. C. State, general manager, Wheeling Township Coal Mining Company; Whitney Warner, vice president, Warner Collieries Company; R. L. Wildermuth, vice president, Lorain Coal & Dock Company; and W. R. Woodford, president, Rail & River Coal Company.

Fuel Research Committee Issues Program

The Special Research Committee on Fuels of the American Society of Mechanical Engineers has issued a proposed program. In March, 1927, the Society, through its Main Research Committee, appointed a Fuels Survey Committee for the purpose of mapping out general directions and some definite plan for research in fuels. This committee made certain general recommendations which have been approved, and the Special Research Committee on Fuels has been appointed, with the following membership:

Chairman, F. R. Wadleigh, consulting engineer; vice chairman, A. C. Fieldner, chief engineer, U. S. Bureau of Mines; secretary, Vincent G. Shinkle, consulting petroleum engineer; W. H. Blauvelt, consulting engineer; S. B. Flagg, fuel engineer, Electric Bond & Share Co.; W. H. Fulweiler, chemical engineer, The U. G. I. Contracting Co.; Prof. R. T. Haslam, technical advisor, Standard Oil Development Co.; J. H. McNally, fuel engineer, Pardee Brothers & Co., Inc.; W. L. Robinson, superintendent fuel and locomotive performance, Baltimore & Ohio Railroad Co.; Dr. Walter Runge, International Combustion Engineering Corporation; Prof. W. Trinks, College of Engineering, Carnegie Institute of Technology; Prof. W. J. Wohlenberg, associate professor of mechanical Engineering, Sheffield Scientific School, Yale University; Dr. H. C. Porter, consulting chemical engineer.

The specific general subjects that have been recommended for research are: the constitution of coal, the carbonization of coal, the preparation of coal, and coal utilization and the abatement of waste in use.

In making their announcements, the committee says:

"While a large amount of research in

fuels has been and is now being done, both in this country and abroad, by engineering schools, technical organizations, governmental bureaus, and industry, there is a great deal of duplication and waste. Correlation of existing information is, therefore, of first importance in approaching this subject of fuels research."

The Sheridan-Wyoming Coal Company and the Hotchkiss Coal Company which operate mines at Sheridan, Wyo., have completed the third year of operations without a single fatal accident in or about their mines, producing during this time nearly 3.000,000 tons.

Bituminous Coal Stocks on January, 55,500,000 Tons

Stocks of bituminous coal in the hands of consumers on January 1 amounted to 55,500,000 tons, according to the United States Bureau of Mines, as compared with consumers' supplies, which amounted to 61,300,000 tons on November 1 and to 75,000,000 tons on April 1, 1927, when the strike of soft-coal miners commenced. Stocks on January 1 this year were slightly larger than those on hand a year before, when production was being stepped up rapidly in anticipation of the miners' strike. Present soft-coal supplies are, therefore, adequate to meet all normal near-future needs, provided production is maintained at a reasonable pace. It is estimated that without additional production and at the recent rate of consumption, present soft-coal supplies are sufficient to last 41 days, on the average. Coal-gas plants, electric utility companies and steel plants have the largest stocks on hand. Supplies of anthracite coal in the yards of retail dealers are sufficient, it is estimated by the Bureau of Mines, to last 57 days. A year ago such supplies were sufficient to last for 54 days.

Shamokin Culm Bank, World's Largest, Leased

Cameron culm bank at Shamokin, Pa., the largest heap of coal waste in the world, has been leased by the Susquehana Collieries Company to the Shamokin Collieries, according to announcement.

Plans are being made to begin washery operations. Equipment has been ordered and the new plant will be situated along the Pennsylvania railroad. A large force will be employed.

The Cameron bank extends for more than a mile around the mountain immediately north of Shamokin and is rich in coal of all sizes.

New Executive Officer for Philadelphia and Reading Coal and Iron Co.

President A. J. Maloney, of the Philadelphia and Reading Coal and Iron Company, has announced the appointment of Frank A. Learned as assistant to the president, with headquarters in Pottsville. He will have charge of the Pottsville shops, the subsidiary water companies, the land department and the compensation department, and, in general, those business matters directly connected with mining and arising within the region. Mr. Learned's appointment is made, the order says, to make more of General Manager G. B. Hadesty's time available "for the direct problems of mining and preparing coal as distinguished from the handling of the business details collateral to the general proposition of colliery opera-

Thomas De Venny Dies

Thomas De Venny, 39 years old, Freeburn, Ky., widely known coal-mine operator in eastern Kentucky, died February 13 following a surgical operation at University Hospital, Philadelphia, Pa.

Mr. De Venny was president of the Williamson Coal Company, of Edgarton, W. Va.; general manager of the Portsmouth Coal and By-products Company, of Portsmouth, Ohio, and a director of the Merchants and Miners' Bank of Freeburn, Ky.

Mr. De Venny was prominent in Masonic circles and was one of three Masons upon whom the rank of Knight Commander of the Court of Honor was conferred during the autumn ceremonial at Covington on November 19.

New Coal Line in Western Pennsylvania

The Pittsburgh Coal Company is planning to give coal operators in the Pittsburgh district the advantage of lower freight rate to Youngstown, Ohio, by the construction of 40 miles of railroad from Smith's Ferry on the Ohio River to Youngstown. A portion of the line of the Pittsburgh, Lisbon and Western Railroad will be used.

The company recently acquired control of the P., L. & W., which operates 23 miles of line from Lisbon, Ohio, to New Galilee, Pa., where it connects with the Baltimore and Ohio. The new line will make it possible to ship coal by river barge from the Pittsburgh district mines to Smith's Ferry and from there to Youngstown by rail at a lower rate than now prevails by present all-rail routes.

The road has filed application to build the new line with the Interstate Commerce Commission. at.

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Experiments With Carbonic Gas For Blasting

Experiments were made at the Lick Branch mine of the Pocahontas Fuel Co., in McDowell County, recently, with carbonic gas. Although used successfully in Illinois mines, this was the first trial of the process in this state. R. M. Lambie, chief of the West Virginia Department of Mines: W. D. Lee. Robert Lilly and Thomas Stockdale, district inspectors, and Joe Bowen, coal operator, were among the visitors who watched the experiment at the mine. The gas blasting entails neither powder nor flame, and is considered much safer than the powder blasting. A four-inch hole is drilled and a cylinder charged with a carbon compound is inserted and set off with electricity. The explosion of the gas pushes out the coal. The increase in lump and egg production is from 10 to 15 percent over the old method, it is stated. The safety feature is the most important value of the method.

57 Percent of Pennsylvania Bituminous Mines in Operation

Reports received by Walter H. Glasgow, secretary of mines of Pennsylvania, disclose that 57 percent of the 2,000 bituminous mines in Pennsylvania are in operation. Of those working, 38 percent are operating full time, he said; 49 percent half time or better, and 13 percent less than half time.

Of the mines that are idle, it was estimated that 80 percent were inoperative because of business conditions, and 20 percent because of labor conditions.

Gas Near Bell Springs, Wyo.

Deep drilling in search of oil near Bell Springs, Wyo., which is 16 miles northwest of Rawlins and some 25 miles southeast of the Lost Soldier oil field, led to the discovery of gas in commercial quantity in 1924. Drilling has been continued, and good shows of oil have been found in several wells, but thus far marketable quantities of oil have not been obtained.

The oil and gas possibilities of the area in which the wells have been drilled were investigated by geologists of the Geological Survey, Department of the Interior. The area examined contains about 80 square miles and was found to include two anticlines-the Separation Flats anticline and the Buck Springs dome-on which all the wells have been drilled. The results of the investigation are presented in Bulletin 796-D of the Geological Survey, that describes the two anticlines mentioned and the other structural features and the rock strata. It also gives suggestions with reference to further explorations for oil and gas.



A scene at the Mama Coal Company's No. 3 mine, near Jenny Lind, Ark., where 13 men were killed in an explosion February 24. One hundred and twenty miners were entombed following the terrific explosion of gas, but all but the 13 escaped.

Anthracite Industry Sound, Says Maloney

The anthracite industry is fundamentally sound, but it must be divorced from the false conception of the economic position it occupies, according to Andrew J. Maloney, president of the Philadelphia and Reading Coal and Iron Company, the principal speaker February 13 at the annual meeting of Group 2, Pennsylvania Bankers Association, in Philadelphia.

Calling attention to the fact that the anthracite industry, doing a business of about \$500,000,000 annually when measured by the mine price of coal, which he said averaged \$7 a ton, is a small industry when compared with many others, Mr. Maloney said:

"I think, however, in the anthracite

industry there has been more noise and more friction than in any other industry in the United States. My opinion is that the industry is fundamentally sound both from an economic standpoint and from the point of service, at least east of the Missouri River; and I am confident that it is susceptible of constructive treatment, although in the past it has had a false conception of the economic position which it occupies.

"Pocahontas" Is Upheld As a Coal Trade Name

"Pocahontas" means a kind of coal, not a dot on the map, the Federal Trade Commission decided recently.

An order was issued requiring the Meteor Coal Company, of St. Louis, to cease using the term for coal mined near the town of Pocahontas, Ill.

"'Pocahontas' as a trade name for coal should be used only to describe a certain high quality of bituminous coal that comes from mines of south-western West Virginia and near-by sections of Virginia," the commission said.

Warden Leaves Kingston-Pocahontas

Charles A. Warden has resigned his post as general manager of the Kingston-Pocahontas Coal Co., it has been announced from the local offices at Hemphill, W. Va. It is stated that Mr. Warden leaves the service of the company in order to give his attention to private business affairs, the company much regretting the severance of relations. Ernest L. Bailey, for several years connected with the interests allied with the coal company, has taken over the management of the company. He comes from Lookout, Ky., and will continue to have supervision of the mine interests of his company in that state.



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WITH THE MANUFACTURERS



Line Start Induction Motors

A line of squirrel cage induction motors suitable for starting on full-line voltage is being placed on the market by Allis-Chalmers Manufacturing Company. These motors are normal torque, high-reactance machines, and will not draw starting current in excess of the limits recommended by the Electrical Apparatus Committee of the National Electric Light Association. They are built in rating 7½ to 30 h.p., 600 to 3,600 r. p. m., low voltage, and are available with either sleeve or roller bearings. All superior features of Allis-Chalmers construction, as employed in squirrelcage motors, are maintained in this new line. A magnetic switch, with pushbutton control, is the only starting equipment required.

Automatic Dynamometer Control Panels

The General Electric Company announces a fully automatic control equipment for use with dynamometers in testing internal combustion engines. Although a great deal of this work is in the nature of research, requiring very close, accurate control of both armature and field, it has been found that the usual manual type of control can now be superseded by the automatic control.

The new control equipment consists of two panels, one a control panel and one a master panel. This arrangement permits mounting the master panel on the dynamometer base, providing complete control of the dynamometer at the point where the testing is being done. The automatic control panel, with its

motor-operated rheostats and absorption resister, is mounted at any suitable, remote place.

These panels are being built in 100 and 150 h.p. capacities. Panels having the same features, but with relatively larger parts, are also being built in capacities up to 400 h.p.



New Standardized Jeffrey Belt Carriers

During 1927 Jeffrey belt carriers for Jeffrey belt conveyors were standardized so that the same stands and bases could be used with any one of the three types of pulleys—the plain bearing, the bronze



bushed and the roller bearing. These grey iron pulleys share three characteristics:

First, they are made with open ends. In handling finely reduced clay, sand, time or cement the dust is apt to collect on closed end pulleys near the bearings, making extra work for the grease scals.

Second, in place of solid ends to insure rigicity of the walls, three arms join the hub and roll. Between the arms six ribs provide additional lengthwise rigidity.

Third, the free carbon in the grey iron acts as a rust repellant. Such pulleys resist corrosion much better than steel pulleys, especially on wet jobs such as conveying washed sand or gravel.



Pulleys with plain or bronze bushed bearings have hubs specially cored out to form large recessed grease pockets connecting with the Alemite pressure lubrication fittings at the end of the hollow shaft. These grease pockets are very useful on long belt conveyors, where a few pulleys are often skipped over or neglected at the regular oiling. The reserve supply of grease will last until the next oiling, where an ordinary pulley would run dry, stick, wear flat, and eventually ruin the belt.

Another advantage claimed for the grease pocket is that grease does not harden in the feed holes as in pulleys, where the grease is fed directly to the bearings. Plain bearings pulleys that are worn may be drilled out and put back into service with new bronze bushings.

For belt conveyors installed to carry materials that are severe on metal bearings—coke grease, for example—Jeffrey makes a roller-bearing pulley pressure greased, accurately fitted and five times grease sealed.

The labyrinth construction provides five pairs of closely joined metal surfaces keeping powdery abrasives from reaching the bearings. In addition, grease under pressure from the inside flows all dirt outward. Slots in each collar make possible perfect adjustment and concentric running.

New Westinghouse Instrument and Control Switches

The Westinghouse Electric and Manufacturing Company has recently put on the market a new type of switch used for connecting any instrument or group of instruments selectively to various circuits as may be required for metering, synchronizing, or for other switching functions. These switches are of the rotary type, and are strong, durable, well insulated, and easily operated. They

are especially adapted to mounting in small space and present a uniform appearance which will harmonize with instruments and similar apparatus on highgrade switch-boards.

The turning of the switch handle operates a shaft on which are mounted various contact-making segments. These segments make or break contact with stationary fingers supported on an insulated base. This base is a part of the supporting structure of the switch, with suitable top and sides, serving to completely inclose the switch parts and to complete the switch structure.

This switch is readily mounted on any commercial thickness of panel. Its terminal board is such as to facilitate any of the accepted methods of switchboard panel wiring. All terminals are numbered, and in making connection the number of the stud should correspond to the number given in the wiring diagram. A Micarta sliding cover on each side makes the housing dust-tight. These covers are easily removable to allow access to all parts. All internal metal parts are nickel-plated.

These switches are made in six standard lengths. The many combinations required are assembled from a relatively small number of standard segments and insulating arc-resisting spacers. All switches are insulated for 600-volt service a. c. or d. c. The contacts will carry 10 amperes continuously and will open 5 amperes under normal conditions.

Switches of this type can be mounted 3 in, apart horizontally and 5¼ in, vertically between center lines.



Keator Products Company, Chicago, Ill., have just recently entered the mining field with the "Keator Kamclip," designed to prevent the escape or slipping of wire rope. They have issued a pamphlet which describes their product fully, which will be sent to those interested upon request.

"Aims and Tendencies in Steam Generation and Combustion Engineering," by Martin Frisch, is the title of a pamphlet recently released through the Combustion Engineering Corporation, 200 Madison Avenue, New York City. In this paper Mr. Frisch reviews important developments that have occurred in these fields during the past few years, and ventures some interesting predictions as to future tendencies.

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New Drum Switches

Three new drum switches are announced by the General Electric Company for use with squirrel-cage and slipring motors. They have been designed particularly for the control of small cranes, hoists, machine tools, etc., but can be applied to advantage on any work where a small and inexpensive drum switch is desired for the control for the types of motor mentioned.



Drum switch with rope wheel and spring return

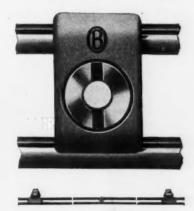
The CR-3200-1250-A is a primary resistance drum switch for squirrel-cage motors, providing four points forward and four points reverse. It is suitable for motors that do not have an overhauling load; that is, on hoists, this switch can be used where worm gearing or automatic mechanical load brakes are used.

The CR-3200-1250-B is a primary resistance switch for squirrel-cage motors, providing four points forward and one point reve-se. This switch is suitable for use where there is an overhauling load; that is, on hoists, this switch should be used where a worm gear or automatic mechanical load brake is not used.

The CR-3202-1308-A is a primary and secondary reversing switch for slip-ring motors, providing five points forward and five points reverse. It is suitable for starting duty or speed-regulating duty, and for use with 220-, 440- and

550-volt motors, rated 15 h.p. and less, where a five-point switch would be chosen.

All three switches have the same frames, but the cylinder developments are different. Horizontal handle, vertical handle, and rope wheel and spring return attachment are interchangeable.



New Dual Bulldog Clamp and Catenary Clamp Announced by Ohio Brass Co.

The mining world has just received announcement by the Ohio Brass Company, Mansfield, Ohio, concerning its new Dual Bulldog Trolley Clamp and companion fitting, the mine Catenary Clamp.

According to the producer, this new patented trolley clamp is a dual action device in one respect, a single action device in another. In the first place, it carries two wires, and in the next it accommodates itself to these two wires by one manual operation.

In other words, it is designed to carry a 4-0 feeder wire directly above the figure 8 or groove wire, which eliminates the necessity for the more costly, complicated overhead construction.

Further, after being screwed onto the hanger, tightening or loosening the head-nut causes the jaws of the clamp automatically to grip or release both wires, which assures a quick, easy job of installation or removal.

When desirable, the feeder wire may be strung first and headnut partially tightened, which leaves the jaws open wide enough to receive the trolley wire to be strung later, after which the whole can be secured by a few additional turns of the headnut.

This clamp can also be used to advantage where feeder wire will be installed later. In such cases the worn trolley wire may be slipped up in the clamp and used as a feeder wire before the new trolley wire is strung.

The Catenary clamp, an essential when the Dual Bulldog is used, is placed in the span between clamps to serve as a current path and as a steadier for the two wires. It also is designed so that its holding and loosening action is directly controlled by the screw, which sets it securely in place or removes it whenever occasion demands.

Both devices are made of Flecto Malleable Iron, hot-dip galvanized. The Dual Bulldog Clamp is made for 0 and 4-0 groove and figure 8 wire, and the Catenary clamp for the 3-0 and 4-0 groove and figure 8 wire.

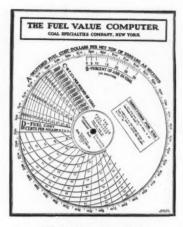
New Edison Safety Trip Lamp

The Mine Safety Appliances Company, Pittsburgh, Pa., announces a new Edison Electric Safety Trip Lamp. The lamps bear the United States Bureau of Mines approval No. 1002.



The new lamp can be hung on the side or back of a car and provides illumination at all angles. The lamp consists of a heavy nickel-plated steel battery container holding two standard Model E Edison cells. The container is locked magnetically and is held to the pit wagon by means of a heavy forged steel holder. The ruby glass cylinder surrounding the bulb is screwed and locked in place by means of a heavy cast ribbed top. The new lamp can be charged on Model E or G Edison racks by special placing of charging clips.

Alexander Milburn Company, Baltimore, Md., have just issued two new bulletins illustrating and describing Milburn Oil Burners and Preheaters and Milburn Acetylene Generators. Copies may be obtained from their home office, 1416 West Baltimore Street, Baltimore, Md.



Fuel Value Computer

Coal Specialties Co., 50 Church Street, New York, has just published some interesting information on their Fuel Value Computer, which they say provides a practical means for the proper evaluation of fuel for steam raising. In behalf of their device they give the following reasons for adopting its use:

"Because this is the age of progress, the buying and selling of coal must pass from the time-worn methods of the past to a basis of scientific coal selection. While good fellowship and friendship are ever factors, yet old customers can not be held and new customers made unless the coal offered has the quality and can stand the test. The coal seller must know his product.

"The Fuel Value Computer enables the coal seller to know the value of his own coal as well as that of his competitors by direct comparison.

"Fortified with this knowledge he can produce logical and conclusive sales arguments actually based upon scientific calculations.

"Use of the Fuel Value Computer also enables the coal seller to meet all the inquiries of the analytical plant buyer regarding the heat value of coal in terms of cost per million b. t. u's. No longer will he have to guess—he will be able to answer in accurate and concise figures."

General Electric Company's monthly bulletin, GEA 378, describes Direct-Heat Electric Furnaces, for heat treating, carburizing and annealing various metals.

Part 3 of an article on "Industrial Electric Heating," by N. R. Stansel, appears in the December issue of the General Electric Review, published by the General Electric Company, Schenectady, N. Y. Copies of the entire series, including Parts 1 and 2, may be obtained upon request to any G. E. branch office or through addressing the home office.

New Sullivan Publications

"Sullivan WG-6 Stationary Compressors," (Bulletin 83-I), 16 pages. This bulletin describes the familiar "WG-6" single stage belt driven, horizontal Sullivan compressors, in general and effective use throughout industry. Capacities range from 68 to 500 cubic feet of free air per minute, at 90 to 120 pounds pressure. Machines are also built for pressures down to 10 lbs. per square inch, in capacities as large as 1,500 cubic feet per minute.

An interesting feature of this bulletin is the large number of installation pictures, from many industries.

"Sullivan Electric Portable Hoists" (Bulletin 76-G). Third edition, 16 pages, describes and illustrates profusely the applications of Sullivan 61/2 hp. portable electric motor driven hoists, both single and double drum. These small machines are being used for a constantly increasing range of applications by the construction industry, and also at mines, in shops, yards, and wherever there is a little job of hoisting or hauling to be done. A new type shown is the "HDE-6" double drum scraper loading hoist for slushing ore or for dragline service outdoors. This hoist is equipped with clutches, but without brakes. It holds 175 feet of %-inch wire rope on the pulling drum, and 300 feet on the tailrope drum. The hauling speed is 160 feet per minute.

"New Drill Steel Furnace: Type GF-2-Portable," (Bulletin 74-C). This advance bulletin describes the new portable drill steel furnace, manufactured by the Sullivan Machinery Co., for the contractor, the quarry or mine. Its light weight (1,000 lbs.) enables it to be moved readily from place to place, while its compactness, 46 by 26 inches of floor space, enables it to be set up anywhere in the corner of the shop, out of doors, or in an underground sharpening station. It will be found particularly useful for the road builder, or the small mine or quarry, which is handling steel for a few drills only, but which wishes to take advantage of modern facilities for speeding up its drilling, by heating and tempering the steel properly.

The GF-2 furnace has a capacity of 13 1¼-in. bits, or 10 2-in. bits on the hearth. It burns either fuel oil, or gas, either natural or artificial. This furnace heats the steel gradually, uniformly, with proper safeguards against burning, and with provisions for tempering on the rising heat.

This new furnace fits in very well with the Sullivan portable drill sharpener, type C for small hammer drill service: i-

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Swope Loan Fund Established

The establishment of a loan fund of \$25,000, the gift of Gerard Swope, president of the General Electric Company, has been announced by President Charles Alexander Richmond, of Union College. Under the provisions of the gift, loans are to be awarded to employes or sons of employes of the General Electric Company and International General Electric Company in the United States and to other students of Union of not less than one year residence at the college. The loans, which are to be made from the income of the fund, are to be awarded in the order of preference given above.

In making his gift Mr. Swope stipulates that applicants for loans shall be considered not only from the standpoint of academic attainments and their financial needs, but also from the standpoint of character, and by contact and oral examination, their personal qualifications for deriving the greatest good from a continuation of their studies.

Simultaneously with this announcement, President Swope made known that the board of directors of the General Electric Company has also set aside \$25,000 to be used as a loan fund for the education of employes or sons of employes of the General Electric Company, but with no restrictions on them as to the college they may wish to attend.

Provision is made under both funds that the recipient shall understand that, if in after years he is in a position to do so, he is to repay the amount so loaned to him, with or without interest. Such money as may be repaid shall be treated as a revolving fund and shall be again loaned under the same provisions.

American Brass Company Appoints Distributors for "Everdur"

The Burndy Engineering Company has been appointed as distributors of Everdur by the American Brass Company. This material is a new alloy of copper, silicon and manganese, which has unusual properties of strength and corrosion resistance. When rolled, the bar has a tensile strength approaching 100,000 pounds per square inch, and a fatigue of 200,000,000 cycles at a tension of 25,000 pounds per square inch, plus and minus.

The Burndy Engineering Company, 10 East Forty-third Street, New York City, is preparing to stock Everdur not only in all basic forms, such as ingot, tube, sheet, bar, but also is in a position to supply castings and forgings of this material. A stock of bolts, nuts and rivets is maintained in New York.

The Rome Wire Company, a division of the General Cable Corporation, has announced that its New York offices have been moved to the Graybar Building, at 420 Lexington Avenue. Mine Safety Appliance Appointments

The Mine Safety Appliances Company, Pittsburgh, Pa., announces the following additions to its sales personnel: The appointment of J. C. Calnon, 3604 Montana Street, El Paso, Tex., as representatives for western Texas and northern Mexico; the appointment of Charles R. Dever, 501 Dewey Park, Nanticoke, Pa., as an additional representative for eastern Pennsylvania; and the appointment of C. E. Noonan as additional representative in western Pennsylvania with headquarters at Pittsburgh, Pa.

Westinghouse Manufacturing Executives Promoted

A number of important promotions in personnel, involving executives of the manufacturing organization, have been made recently by the Westinghouse Electric and Manufacturing Company.

Announcemen has been made by J. M. Hipple, works manager of the East Pittsburgh Works, of the appointment of E. C. Brandt and F. J. Shiring as assistant work managers, and of J. E. Webster as chief plant engineer.

Changes simultaneously announced by E. R. Norris, general works manager, are the appointment of A. E. Kaiser as director of production for all works, and S. C. Hoey as works manager of the Homewood Renewal Parts Works.

Martindale Electric Company

The Martindale Electric Company, 1260 West Fourth Street, Cleveland, Ohio, announces that they are carrying stocks of most popular sizes of commutator stones at their New York branch in charge of Mr. E. H. Mitcham, 6 East Forty-Sixth Street, New York City, and their Los Angeles branch in charge of Mr. John M. Dexter, 210 East Third Street.

The Martindale Electric Company, 1260 West Fourth Street, Cleveland, Ohio, announce a 4-page folder illustrating and describing three type of Portable Blowers, ranging in price from \$30 to \$60. Folder mailed on request.

C. E. Stone Now President of the Interstate Drop Forge Company

Chas. E. Stone, since 1924 vice president of the Interstate Drop Forge Company, manufacturers of drop forgings, Milwaukee, has been elected president, succeeding C. R. Messinger. Lamar S. Peregoy was elected vice president. C. C. Bromer and J. C. Marker were reelected treasurer and secretary, respectively.

The Interstate Drop Forge Company is a member of a group of affiliated companies which includes the Sivyer Steel Casting Company, the Federal Malleable Company, and the Chain Belt Company, all of Milwaukee.

Westinghouse Catalogue of Electrical Supplies 1928-1930 Contains Many New Developments

Publication of the 1928-1930 catalogue of electrical supplies of the Westinghouse Electric and Manufacturing Company has just been announced. This catalogue presents the electrical and mechanical features and application information for all supply apparatus and appliances manufactured by the Westinghouse Company, and in addition describes and illustrates a representative list of large motor and generating apparatus.

All equipment obtainable through district offices or agent-jobbers is thoroughly described and illustrated. New equipment and modifications of former designs described in the new catalogue are numerous and cover a wide variety of applications, such as instruments and relays, switchgear, traction, marine, aviation, farm lighting, motor apparatus and prime mover apparatus.

Important among new developments is a complete line of network protectors, transformers, regulators, and relays that are especially designed for low voltage alternating-current distribution networks. General adoption of the alternating-current distribution system in preference to the three-wire direct-current system is causing a steadily increasing demand for the new alternating-current equipment.

In the field of instruments and relays alone there are described in the new catalogue more than 50 new or improved designs. A triplex instrument for measuring current in all three phases of a line and the new line of OB watthour meters and numerous other important contributions to the electrical industry are described in the new catalogue.

Descriptions of new and improved designes of switch-gear equipment include new designs of oil and carbon circuit-breakers, new types of disconnecting switches, automatic network protectors, new and modified designs of bus-bar supports, new instruments and control switches, and an eight-circuit terminal block.

Among traction apparatus there are described various new designs of trolley frogs and clamps, adjustable spreaders, catenary pull-offs, catenary steady strains, dead-end clamps, messenger clinch sleeve, arc-weld flexible bonds, arcon rail bonds, and flameweld signal bonds.

The new catalogue, containing approximately 1,200 pages, is the result of the combined effort of representatives of the engineering, sales and advertising departments of the Westinghouse Company to give the electrical industry the most accurate and complete information and data concerning many products.

Bulletin Describes Rheolayeur Process

"The Rheolaveur Process for Washing and Preparing Coal" is the title of a bulletin that has been issued recently by the American Rheolaveur Corporation. Wilkes-Barre, Pa. The bulletin sets forth in detail this process for preparing coal and describes and illustrates the Rheolayeur installations at the Loomis Colliery of the Glen Alden Coal Company, the Neilson Colliery of the Shamokin Coal Company, and the Boncarbo Colliery of the American Smelting & Refining Company. One section of the bulletin is given over to the "Carpenter Centrifugal Drier," a continuous drier for the finer sizes of coal.

Copies may be obtained from the company at Coal Exchange Bldg., Wilkes-Barre.

Sulzer System for Dry Quenching of Coke

The first comprehensive presentation of the "Sulzer System for the Dry Quenching of Coke" is given in a catalogue recently issued by the International Combustion Engineering Corporation, New York City. This equipment is manufactured by the Dry Quenching Equipment Corporation, a subsidiary of International Combustion Engineering Corporation, and is applicable wherever the quenching of hot coke is a problem. Its advantages over the wet quenching method in general use are given and described in detail and the economies to be derived are illustrated by specific examples.

The by-product coke production of the United States in 1926 amounted to 44,-376,586 tons. Of this, the total heat value of approximately 2,250,000 tons could be recovered and used for steam production if the dry quenching method were in general use. The fact that this enormous and needless waste is going on makes the adoption of dry quenching an economic necessity and establishes it as one of the most vital of present-day industrial developments.

This catalogue will be sent on request to those interested.

Hallgarten & Co., investment bankers, announce the appointment of Arthur Lazarus as a specialist for the development and investigation of industrial financing.

Mr. Lazarus is a former chief of the Cost Accounting Bureau of the Chamber of Commerce of the United States, for the past five years a consultant on management problems of the Metropolitan Life, a certified public accountant, and a member of the New York bar.

Not only will the work of Mr. Lazarus deal with financing but, where the situation warrants, he will be available to large companies to assist on organization and management problems.

"Morse Silent Chain Drives"

The Morse Chain Co. has recently issued a handbook on silent chain drives that treats very thoroughly the subject of silent chain power transmission and greatly facilitates the selection and design of the proper drive for any given requirements.

Complete instructions on how to design silent chain drives are given, together with a discussion of the various factors that must be considered. This is followed by an example of an actual design.

A comprehensive list of typical drives is given to assist engineers in estimating cost of drives similar to these shown. It is also helpful in that it gives pitch, width and number of teeth which may well be used on similar drives.

Also there are tables giving sprocket diameters, sprocket list prices, chain list prices, standard hub lengths, bores and other data that is useful in the successful design of chain drives. Complete instructions are given as to the installation, care and operation of Morse Drives.

Another section of the book is devoted entirely to the illustration and description of Morse Drives on various types of machinery and in almost every industry.

The new Morse Speed Reducer with Morse Flexible Coupling, inclosed in castiron housing, is also completely illustrated and described.

This book is a complete and ready reference for solving most any power transmission problem. Copies may be procured from the company at Ithaca, N. Y.

Ajax Electrothermic Corporation, Trenton, N. J., has just issued a new bulletin which is available to those interested in the subject of high frequency furnaces. The bulletin gives for the first time illustrations and information on the new low-priced 3 kv-a converter, and photographs and cross-sections of various new models of the Ajax-Northrup furnaces. A number of pages are devoted to a non-technical explanation of the Ajax-Northrup high frequency principle and methods of smelting.

The February issue of the Explosives Service Bulletin, issued by E. I. du Pont de Nemours & Co., Inc., contains an article by A. E. Anderson, technical representative of the company, entitled "Sinking Wet Shafts." Copies of this bulletin may be obtained by sending a request to any of the du Pont branch offices.

How a vertical pipe line was ox-welded and lowered through a mine shaft is told in the February issue of Oxy-Acetylene Tips, published by the Linde Air Products Co., New York City, in an article entitled "2,200 Feet Down."

Determining Safety Factors on Steel Posts Described in New Booklet

An interesting and informative booklet on Special High Carbon Steel Posts has just been issued by the Sweet's Steel Company of Williamsport, Pa., which describes a new and practical method for testing and determining the safety factors of steel posts.

This unique method enables anyone contemplating the building of any type of wire fence to analyze wind loads and stresses and thus arrive at the scientifically correct size of steel post required for his particular purpose. Copies of this new booklet may be obtained free of charge by writing Sweet's Steel Company at Williamsport, Pa.

Fusion Welding Corporation, 103d Street and Torrence Avenue, Chicago, Ill., have just issued a descriptive bulletin on their Fuzon Arc Welders, copies of which are available upon request.

Among the bulletins recently released by the General Electric Company are GEA-891, G-E Fan Equipment, motor and controls for ventilating fans in coal and metal mines; GEA-892 G-E Motor Drives for centrifugal pumps in coal and metal mines; and GEA-893 Electric Drive for coal and ore hoists. Copies may be obtained through the Schenectady office, or through any branch office.

Hughes Tool Company, Houston, Tex., has issued a pamphlet dealing with Hughes Drilling Valves and Fittings, made of heat-treated chrome nickel steel. The bulletin carries a vast amount of information on this subject, is fully illustrated and gives complete specifications, etc. Copies cay be obtained upon request to the Houston office.

Twenty-seven thousand, or 42 percent, of the employes of the General Electric Company in its service for six months or more are holders of about \$30,000,000 worth (face value) of G. E. Employes' Securities Corporation bonds, an average of approximately \$1,000 per person, according to a statement made public by J. R. Lovejoy, president of the corporation and vice president of the General Electric Company.

These bonds pay 6 percent interest, but so long as the original holder remains in the employ of the General Electric Company an additional 2 percent is paid by that company.

In making this announcement Mr. Lovejoy stated that a new offering of the bonds to employes would be made. These bonds, as with previous issues, may be bought on the installment plan with deduction from wages. Any employe who has been in the service of the company for six months or more is eligible to subscribe up to \$500 a year.

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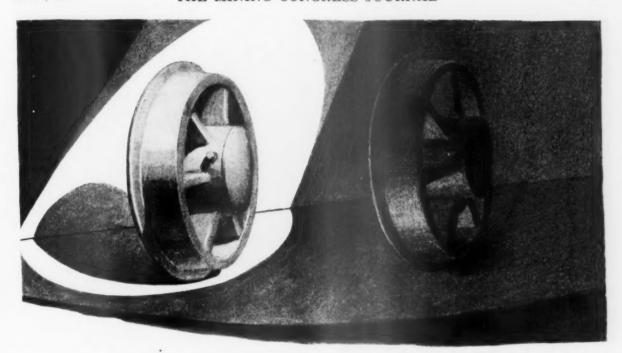
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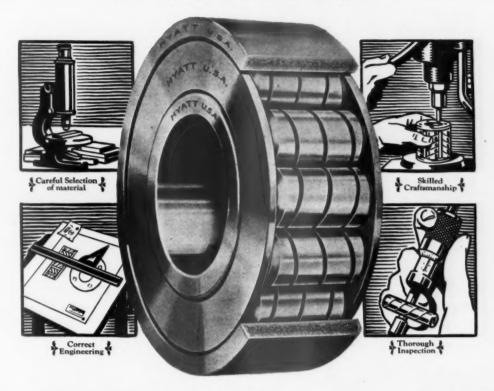
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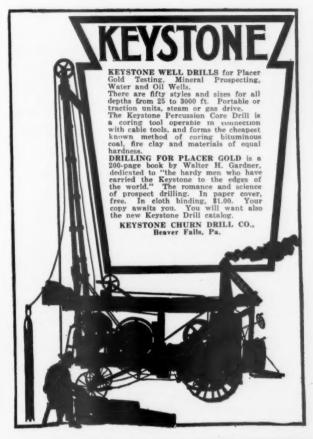
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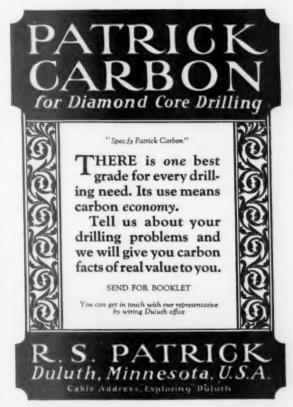
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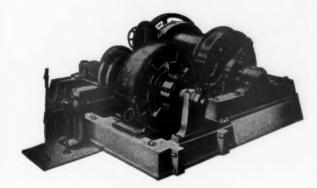
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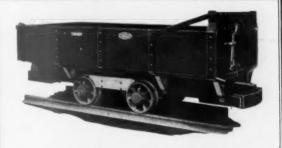
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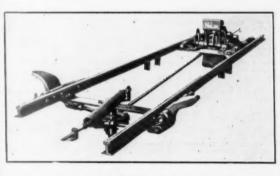
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Third Annual

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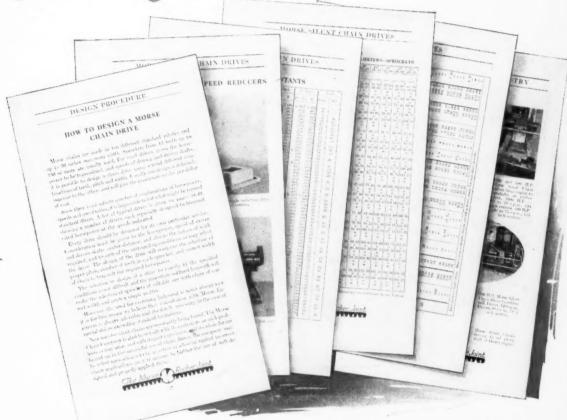
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